ELECTRICAL WORLD

McGraw-Hill Publishing Company, Inc.

FEBRUARY 21, 1931
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sells { APPLIANCES / LOAD

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A consolidation of Electrical World, Electrical Engineer and American Electrician

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Portable motor on the farm

FEBRUARY 21, 1931

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Performance Depends Upon Inbuilt Quality

It always has—and always will

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ELECTRICAL WORLD

for the Week Ending

February 21, 1931

In the future we shall sleep in beds shaped as covered wagons, and instead of pajamas we shall have ultraviolet light rays pouring down on us as we sleep, producing the effect of reposing on a sunlit meadow in a tropical land. The benefit to our health should be incalculable.

M. LUCKIESH,
Director
Lighting Research Laboratory,
General Electric Company

Federal Power Board faces a test in New River case

Utility executives will co-operate on merchandising

—**Pinchot wants utility scalps,** seeking battle in Legislature and charging Philadelphia Electric with assorted crimes. Company offers prompt public reply which leaves the Governor sulky—*pp. 349 and 350.*

—**Automatic handling of grain** accomplished through interlocked elevator control, preventing costly choke-ups and reducing other operating hazards. West Coast mills provide for almost every conceivable emergency—*p. 356.*

—**Carlisle now N.Y.E. chairman,** taking place of late N. F. Brady. Further engineering, operating and financial unification of New York properties foreseen as Niagara-Hudson head moves up in New York Edison—*p. 346.*

—**"Let's go electrical" is idea** of Boston promoter of appliance sales and use, who sees the industry lagging deplorably in the utilization by its members of devices urged upon the public—*p. 371.*

—**Sectionalize system promptly** when trouble fails to clear is advice of a metropolitan load dispatcher who stresses desirability of preventing difficulties by tactical maneuvers—*p. 361.*

—**Leaders tackle merchandising** in co-operative move to clear utility-department-store-hardware-store situation for benefit of all and establishment of just what does or does not constitute good trade relations—*p. 347.*

—**Five states ask jurisdiction** in New River case. New Federal Power Board meets first real test as commonwealths protest. Appalachian Electric Power wants minor-project license—*p. 346.*

—**Commission wins in Georgia** as State Supreme Court decides against right of Georgia Power Company to obtain restraining injunction in Crisp County case involving rates—*p. 347.*

Five States Support the Appalachian Company in New River Case

JUDGING from the attitude of its members, all of whom are sitting, in the course of hearings on the New River case, the new Federal Power Commission is likely to make an early decision as to whether or not it will assume full jurisdiction over the proposed project of the Appalachian Electric Power Company on New River near Radford, Va. The old commission suggested that the case be adjudicated in the courts because of its fundamental importance. The power company in challenging the commission's jurisdiction over a site on a stream alleged to be non-navigable has had the active support of state authorities in Virginia, West Virginia, Tennessee, Arkansas and Kentucky.

A major license covering this project was offered the Appalachian company in 1926. This was refused on the ground that the federal government had no jurisdiction in the matter other than the possible safeguarding of navigation in the Kanawha River, of which the New is the principal tributary. C. A. Micou, counsel for the company, declared that New River is not navigable for 155 miles below the site for which his company is seeking rights. He continued with an examination of the constitutional questions involved. In this Chairman Smith took part, asking about the bearing of the "commercial clause" of the Constitution.

Commissioner McNinch asked Mr. Micou if it would be possible to grant a minor license and later expand it into the full license should it become apparent that the federal government should take jurisdiction. Mr. Micou said that his company would not want to waive any right that might lead its operation to be subject to the commission. Chairman Smith expressed the opinion that the purpose of the water-power act is not so much the protection of navigation as it is the effective regulation of great public utilities in the public interest.

The whole annual income of the United States, if applied to a navigation project on New River, would not make it usable as a waterway, former Governor Trinkle of Virginia, who was presented by W. E. Carson, chairman Virginia State Conservation Commission, told the commission. Efforts to have it considered navigable are purely political, he said. Virginia would have no objection to a minor license.

On behalf of the Public Service Commission of West Virginia the authority of the Federal Power Commission to take jurisdiction was challenged emphatically by F. M. Livezey, its attorney. The state commission does not concede even the right of the federal government to issue a minor license, though it will not oppose that action.

C. R. Luker, representing the Governor of Kentucky; Assistant Attorney-General Beeler of Tennessee and Assistant Attorney-General Caldwell of Arkansas also championed state rights.

On the request of attorneys for the power company, the commission allowed until February 28 for the filing of an additional brief. A telegraphic request from Governor Pinchot of Pennsylvania asking permission to file a brief also was granted. In his telegram Governor Pinchot protested against the issuance of a minor license for the project. Permission to be heard or to file a brief was denied to the Popular Government League on the ground that the commission itself and its counsel would represent the public.

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Carlisle Is New York Edison Chairman

FLOYD L. CARLISLE, chairman of the board of directors of the Niagara-Hudson Power Company, was on Tuesday of this week elected to the same post in the New York Edison Company, in succession to the late N. F. Brady. This appointment is interpreted in financial circles as a step toward closer relations between the two utility groups, whose eventual consolidation has been predicted frequently in the past. An immediate implication suggested is the interconnection of present and future hydro-electric systems of northern New York with the steam plants in the metropolitan area of New York City, making possible interchange of energy where this could be done economically, or in emergencies.

In the course of the past year the Niagara-Hudson Power, United Corporation and American Superpower companies are understood to have added to their holdings of Consolidated Gas, which controls the New York Edison, indicating a growing community of financial interest among these organizations. Mr. Carlisle is a director of the United Corporation, backed by J. P. Morgan & Company, and of Bonbright & Company. The latter are back of the American Superpower Corporation.

At the meeting of the New York Edison board, in addition to Mr. Carlisle's appointment, Frank W. Smith was elected a vice-president. The other officers were re-elected. A biographical sketch of Mr. Carlisle will be found on page 379.

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COMPETITORS MEET

Near the coal fields of north central Alabama a new natural-gas pipe line crosses the transmission system carrying hydro power. An oil well is all that lacks to make the confrontation of rival fuels complete.

▼

Conferees Agree at Last on Muscle Shoals Bill

PASSAGE OF THE MUSCLE SHOALS BILL has been virtually assured by the action of a majority of the conferees on Wednesday in signing a compromise agreement for submission to the two houses of Congress. This agreement, which was signed by all of the Senate conferees and three of the House conferees, is solely in respect to the manufacture of fertilizer, the fertilizer clause having been the last remaining obstacle to a complete agreement. Although tentative agreements have been reached before in the conference committee, the required number of conferees have heretofore refused to sign a report on agreement.

It is not expected that there will be considerable opposition in either the House or the Senate to accepting the conference report. The passage of the legislation before adjournment on March 4 is, therefore, taken as a matter of course. It is not certain, however, that the President will approve of the gov-

ernment venturing into the power business, and he may veto the bill.

The agreement reached merely clarifies the terms of the lease of the fertilizer facilities. A bonus is provided whereby the lessee is to receive 15 per cent of the power used in the manufacture of fertilizer for his own purposes outside of the government reservation. If the fertilizer facilities are not leased under the terms specified at the expiration of twelve months, the entire plant reverts to the government. Nothing has been changed in the bill as it applies to the production and distribution of power. The government will produce the power and will be vested with the authority to build transmission lines.

▼

Joint Committee to Survey Merchandising Practice

A RECENT CONFERENCE in New York brought together representatives from the National Retail Dry Goods Association, the National Retail Hardware Association and the National Electric Light Association for the purpose of developing a frank exchange of views and to arrange for a study of the problems of merchandising electrical appliances, on which there has been criticism of power-company methods. The dry goods representatives were A. Lincoln Filene of Boston, D. F. Kelly of Chicago, Alfred B. Koch of Toledo (these three having composed a committee appointed by their association to study the merchandising practices of power companies), Lew Hahn and J. I. Straus. R. J. Atkinson represented the hardware men, and the utilities' conferees were Marshall E. Sampsell, Charles L. Edgar, John F. Gilchrist, C. E. Groesbeck, W. R. Putnam, J. F. Owens and M. S. Sloan.

The conference was based on the view that the public interest is paramount, and it was conceded that utility companies have a definite responsibility to develop the use of appliances which benefit their customers.

Local differences of opinion on merchandising practices were recognized, but it was believed that by surveys to determine facts and by conferences recognized practices can be established in local communities, to which end a national committee can render much assistance. It was therefore strongly recommended that in as many local communities as possible throughout the United States the business groups represented in the conference be encouraged to confer with each other for a frank interchange of viewpoints and with the object of bringing about merchandising relations mutually satisfactory and in the public's best interest.

The following action was taken at the conference:

1. A survey and factual study of merchandising of household electrical appliances will be commenced at once by this committee, the expense to be equally shared.

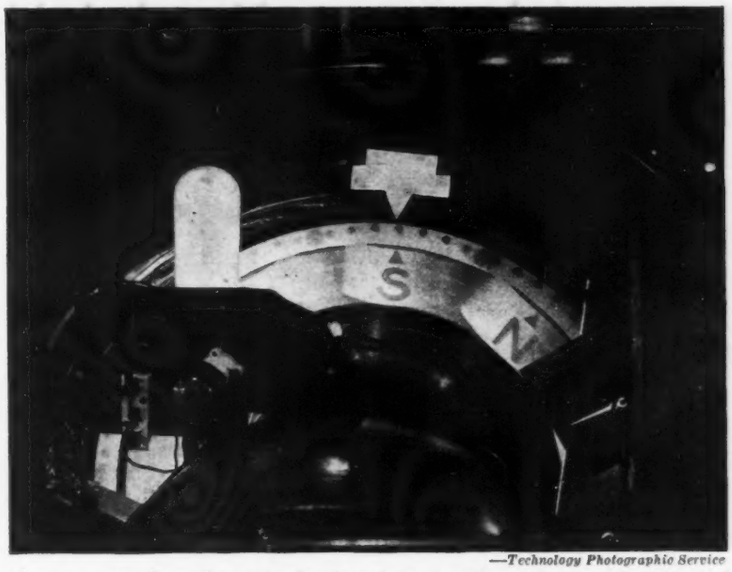
2. The committee will continue to function indefinitely, convening as may be necessary to receive reports from the survey or to give direction for its conduct.

3. D. F. Kelly of "The Fair," Chicago, was made the chairman of the committee. Mr. Kelly and J. F. Owens, first vice-president of the N.E.L.A. and vice-president and general manager of the Oklahoma Gas & Electric Company, were authorized to supervise the particulars of the survey for their respective groups and to function in behalf of the committee as a whole in the interim.

4. The scope and purposes of the survey will be as follows: (a) To make a factual study of merchandising of household electrical appliances and of the policies and practices now followed by the constituents represented in the conference in the promotion and sale of these appliances; (b) to determine the practices, and areas of their application, now followed in merchandising of electrical appliances which are causes of misunderstanding; (c) to endeavor to bring about full understanding of their respective viewpoints between those interested in merchandising of electrical appliances, to the end that the business interests of each may be properly promoted but always predicated on recognition that the public interest is paramount; (d) to determine those policies and methods in electrical merchandising which have proved most sound and successful and to make suggestions for improvements in facilities to the public and for stimulation of household uses of electricity generally.

At the suggestion of Mr. Filene, the conference engaged E. H. Paine to conduct the survey and report to Mr. Kelly and Mr. Owens.

NEW STROBOSCOPE WORKS IN 0.00001 SECOND



—Technology Photographic Service

A new type of stroboscope developed at the Massachusetts Institute of Technology by Harold E. Edgerton took this photograph of a good-sized motor running at full speed. At the left is a thyraton mercury-arc tube supplying the intense actinic light which makes it possible to take pictures at exposures of ten one-millionths of a second

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Economic Problems Before N. E. L. A. Committees

FOUR CROWDED DAYS were devoted by the N.E.L.A. engineering committees this week, in well-attended meetings at St. Louis, to methods of service, to ways of building and operating economically and to planning for the future. A spirit of frank discussion prevailed.

Of particular interest were the sessions of the power systems engineering committee. An illuminating presentation of the weaknesses of political ownership and operation and of the necessity that corporate achievements should be maintained in their present superiority was made by Edwin Gruhl. Following this address three phases of interconnected operation were discussed, one dealing with co-ordinated power-company transmission systems and communication facilities as these are viewed by the telephone industry and two with interconnection contracts. In the latter the economic advantages of joint use of facilities and the necessity of simple contracts emphasizing purpose and of adequate authority to work out operating problems were emphasized. Representatives of light and power companies and of interconnected organizations in all parts of the country outlined the conditions under which these operate and the principles underlying system planning.

Similar practical and fruitful proceedings marked the gathering of members and delegates in the case of all the other committees.

Tomorrow's Engineering Story Is Told at Midwest Power Conference

ELECTRON tubes as power-handling and control apparatus stirred the imaginations of those in attendance at the fifth Midwest Power Conference and fourth national A. S. M. E. fuel meeting in Chicago last week. This subject was treated by C. W. Stone, General Electric Company, in a paper entitled "Distribution of Electric Power with High-Voltage Direct Current." Power systems were visualized as operating without the instability due to frequency disturbances.

With oil circuit breakers supplanted by electronic switches which would interrupt heavy-current switches in a half cycle or less, without the specter of short-circuit energy concentration and under conditions where synchronism would not be necessary for parallel operation, transmission costs, both losses and investment, would be cut in half or even more greatly reduced, Mr. Stone declared. These happy conditions are for tomorrow if present laboratory conclusions are upheld by operating experience.

Another lifting of the curtain on the future was apparent in the recital of utility contract relations with industrial firms in the paper on "Dual-Purpose Power Plants" by John M. Drabelle, Iowa Railway & Light Corporation. What utilities will have to consider much more seriously than they do now if they want to include among their customers large by-product and process steam users was indicated in this paper. The speaker referred to arrangements between utilities and industrial firms in six specific cases. Commenting on this subject, C. F. Hirshfeld referred to attitudes taken by utility companies in the United States and in Europe which have prevented solutions of mutual utility and industrial problems. So long as these attitudes persist there can be little progress, he said. Dual power plants must in each case have individual justification from the two standpoints of economy and load continuance. A utility is a trustee for its customers and investors, so there is a limit to gambling on the continuity of single industrial loads dependent on the success or failure of manufacturers in disposing of their products.

Very hopeful prospects of solving the problems of handling high-temperature steam were held out by L. W. Spring, Crane Company. Already steam temperatures up to 825 deg. F. are being handled successfully, and requests are being received for metals to carry steam at 1,000 deg. continuously for ten years at pressures up to 3,000 lb. Temperatures up to 1,500 deg. are being considered in the oil industry. From extensive tests the conclusion is reached that there is no need to fear creepage or flow of metal at these temperatures because rupture will not occur until warning is given by a stretch of 10 to 25 per cent. There is no danger that such stretching will pass unperceived unless there is seriously localized overheating.

Data on turbine space requirements and price for kva., as well as unit economies, were significant parts of Prof. A. G. Christie's paper, which was presented quite fully in the ELECTRICAL WORLD of last week (page 317).

Describing the future boiler room, George A. Orrok said all solid fuel will be burned in a gaseous state, large-capacity boilers with high heat-transfer rates will be used and the smoke and dust nuisance will be virtually abolished. This future boiler plant will embody complete gasification and coking equipments and pipe-line transportation of fuel.

Other timely subjects were covered in the sessions.

▼

HISTORY FLOODLIGHTED

St. John's Church, Richmond, where the ghost of Patrick Henry still declaims, is now thrown into night relief by four 68,000-cp. floodlamps, skillfully arranged to illumine the church and not the trees.

▼

Commission Wins Suit in Crisp County Case

GEORGIA COURTS have no power to enjoin the investigation of public utility rates by the state's Public Service Commission, according to the Georgia Supreme Court, which has just dissolved the injunction obtained by the Georgia Power Company in the Crisp County Power Company case, affecting the county-owned plant that new serves Cordele and vicinity in competition with the Georgia Power Company.

The case, as previously told, arose when the commission ordered the Georgia Power Company to show cause why all of its rates should not be reduced to the same level as its rates in Cordele, where the company had reduced charges 35 per cent to meet a 10 per cent rate cut on the part of the Crisp County Power Company.

The Georgia Power Company contended that the words "Discrimination invariably follows," used in the rule nisi of the Public Service Commission, prejudiced the case by setting forth that discrimination existed. In dissolving the injunction the Supreme Court said that the language of the rule nisi may have been "inept," but that the power company should have responded and then, if it wished to do so, attacked any order made by the commission to fix the rates.

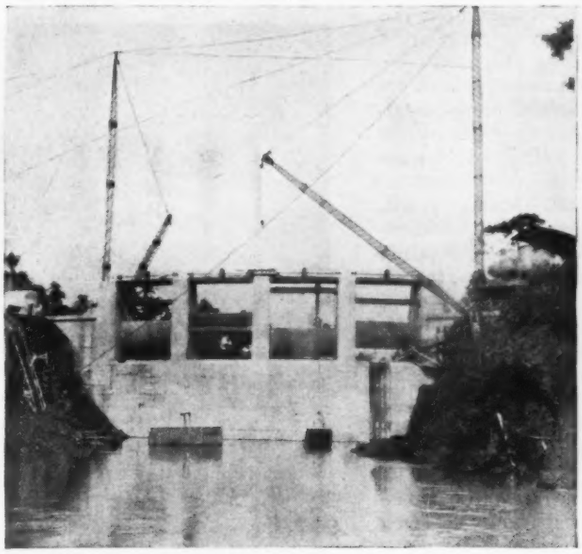
▼

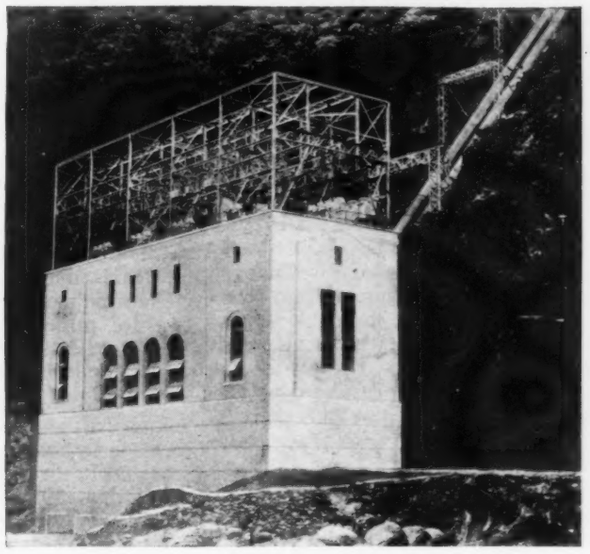
Unification Should Bring Immediate Lower Rates

FEATURES OF THE annual report of the New York Public Service Commission to the Legislature, made public on February 16, are its recommendation that reduction in rates to give merely "a return on the prudent, unimpaired investment in the property" be tried by any utility company whose business has fallen off, rather than insistence "upon the value to which it feels it is entitled under the United States Constitution" (the specific application being to gas companies complaining of electrical competition) and its declaration in treating of the continued, though lessened, trend toward mergers that "if unification is permitted, the public should obtain a considerable share of the economies resulting from unification immediately upon their becoming effective."

The report dwells upon progress in rural electrification since the Legisla-

SIXTEEN MONTHS' STRUGGLE BRINGS HYDRO-ELECTRICITY TO MANILA





EXTRAORDINARY topographic, hydrographic and climatic difficulties were overcome between August, 1929, when construction began, and the inauguration a few weeks ago of the Associated Gas & Electric System's Botocan Falls high-head hydro plant 50 miles by air line and 95 miles by road and water from Manila, P. I. The dam, built 1,900 ft. above the falls, is of concrete, overflow gravity type, 180 ft. long, 77 ft. high and 67½ ft. wide at the base. Transmission is at 110 kv.—very high for the Orient—steel towers built to withstand gales of 150 miles leading to a large new substation at Manila.

The power house, in the gorge, contains three generators totaling 16,000 kw. A tunnel nearly 4,000 ft. in length was built part way through a neck of land between the Botocan and Dalitiuan Rivers. The falls, 215 ft. in height, were pictured in the ELECTRICAL WORLD for March 15, 1930 (page 519).

▼ ▼ ▼

ture last year made provision for a division of rural electrification in the Public Service Commission, saying that much of this progress is due to the adoption of the so-called "Adirondack plan," which provides for a guarantee of approximately $24 per month per mile of line before the company will provide an extension. New York, the report says, has central-station service on approximately 35 per cent of its farms, being outranked only by California.

▼

Radio Corporation Again Loses in Monopoly Suit

THREE YEARS OR MORE of litigation over the pooling of radio-tube patents reached another stage on February 13, when the United States Circuit Court of Appeals at Philadelphia affirmed the decree of the District Court in Delaware which held that the agreement between the Radio Corporation of America, the General Electric Company, the Westinghouse Electric & Manufacturing Company, the American Telephone & Telegraph Company and several subsidiary organizations violated the Clayton anti-trust law. This suit was that brought by the De Forest Radio Company and other independent tube manufacturers, the plaintiffs claiming to have been virtually excluded from the radio-tube market by the monopolistic contract of the defendants.

This was the second time that the case had reached a federal court of appeal. The court in Delaware granted a preliminary injunction in February, 1928, ordering the companies to discontinue the "pooling agreements," and a higher court sustained the finding. In November, 1929, the Delaware court made the injunction permanent, and the Radio Corporation again appealed. It will now carry the case to the United States Supreme Court.

The federal government has pending a similar suit against the Radio Corporation and its allies in which they they are charged with a "combination and conspiracy in restraint of trade and commerce."

▼

Philadelphia Electric Answers Governor

IN FULL-PAGE ADVERTISEMENTS in the Philadelphia newspapers of last Saturday W. N. Taylor, president Philadelphia Electric Company, printed a letter sent by him to Governor Pinchot and opening as follows:

According to the newspaper reports of your radio address of Tuesday evening, February 10, in which you referred to the recent residential rate reduction by the Philadelphia Electric Company, you made the statement that "there was a trick in the reduction because bills were rendered monthly instead of every three months, with the result that patrons did not consume enough electricity to benefit from the quantity rates."

It is evident that whatever your source of information may have been it was grossly in error and made without knowledge of the facts, as will appear from the following:

When the change from quarterly billing to monthly billing was made the kilowatt-hours in each step of the rate were divided by three so that the lowest rate of 3 cents is reached just as readily now under monthly billing as previously under quarterly billing. . . .

Your further statement that "the boasted rate reduction occurred in a consumption range rarely reached by the average consumer" is also erroneous. An examination of the rate will show that the reduction was made in the first step of the rate from 8 to 7½ cents, so that all customers in Philadelphia benefited. At the same time a reduction from 9 to 8 cents was made in the first step of the rate to a large part of the suburban area.

Mr. Taylor, in the advertisement, went on to compare the new rates with those under the superseded tariff, figuring the total annual saving on existing use as approximately $1,750,000, of which $610,000 is in residential lighting. The Governor replied to Mr. Taylor by asserting that the decreases were "microscopic." He said that the minimum charges for household users in the 25-50-kw.-hr. and 100-kw.-hr. groups would be only 9 cents less monthly than under the old rate.

Reject Niagara Treaty as Favoring Power Men

AFTER PONDERING OVER TESTIMONY to the effect that the pending Niagara remedial treaty with Canada would enable power interests on the American side to save $5,000,000 in fuel costs over a seven-year period, through the acquisition of half the additional 20,000 sec.-ft. of water to be diverted, the Senate foreign relations committee on Wednesday voted unanimously to reject it. Senator Borah, chairman of the committee, said that it is its view that the two governments should do the remedial work, which is aimed at preserving the beauty of the falls, directly, instead of leaving it to the power companies.

▼

Power and Regulation in State Legislatures

ARKANSAS.—A bill before the Senate would allow utility companies to exchange their franchises, on expiration, for indeterminate permits. A House committee has voted unanimously to approve the bill noted on February 7 to levy a tax on electrical energy to pay the bonded indebtedness of public school districts. The tax was changed to a flat 8 per cent on the selling price, assessed monthly. It would apply equally to private and municipal plants, but not to electricity used in agriculture. Raising the price of energy to cover the tax is forbidden.

INDIANA.—The Senate has passed by 37 to 3 the Moorhead utility bill granting power to the Public Service Commission to approve or reject mergers after an investigation. This bill defines utility property in a city or town as the unit for rate making in that community. Another Moorhead bill bringing utility holding companies within the jurisdiction of the commission lost by a small margin. In the House three bills affecting power companies have been introduced. One would put a tax of 0.25 cent a kilowatt-hour on electricity sold at less than 2 cents and a tax of 1 cent on all sold at a higher rate; another would impose a tax of from 10 to 65 cents on every pole and a tax of from 0.5 cent to 5 cent per 100 ft. on aerial and underground cables running along public highways, and the third would require electric utilities to extend their lines along highways upon petition of 5 per cent of the residents, provided that the residents were willing to pay the cost of the extensions. A bill to prohibit sale of merchandise by utilities is a new Senate proposal. Another bill before the Legislature would prohibit the leasing of municipal plants to private companies without a referendum.

IOWA.—The perennial effort to establish a public utility commission has been made this year by a member of the Lower House. The proposed commission would include five members, including the three members of the existing Railroad Commission, which would be abolished, and two others to be appointed by the Governor. Another bill to set up a utility commission is reported to be under preparation in the Attorney-General's office. Bills placing all utility securities under the blue sky act and permitting municipalities to pledge earnings of utilities in payment of plants purchased have been introduced in the Senate and House respectively.

KANSAS.—The state affairs committee of the House has made an adverse report upon a bill declaring it to be unlawful for any corporation owning more than 10 per cent of the capital stock of any other corporation to retail merchandise of any manner or form. Another measure is pending which is designed to prevent public utility corporations themselves from engaging in such business.

MISSOURI.—The judiciary committee of the House has held hearings on a bill designed to prevent public utilities from selling merchandise in competition with independent merchants. The first hearing was attended by more than 400 persons, and for four hours hardware dealers, plumbers, radio dealers, druggists and furniture dealers from all parts of the state told members why the bill should be passed, charging that the utilities sell merchandise at a loss and make up this loss through higher rates for gas or electricity. Representatives of utilities disputed this statement. A bill to extend the corrupt practices act to elections involving franchises for public utilities provides that any utility directly or indirectly interested in any such election shall be required to file a sworn statement of all money contributed.

NEW JERSEY. — Assemblyman Schoenfeld of Hudson seeks an investigation of the Board of Public Utilities Commissioners. Under his resolution a commission of three members of each house would be appointed by the presiding officers to examine the acts of the board and determine whether it should continue to be appointed by the Governor or become elective.

NEW YORK.—A bill to force electric power companies to inspect power plants, substations and transmission and distribution lines, and directing also that the Public Service Commission appoint other inspectors to do the same work under its direction independently of the companies, has been presented in the Assembly.

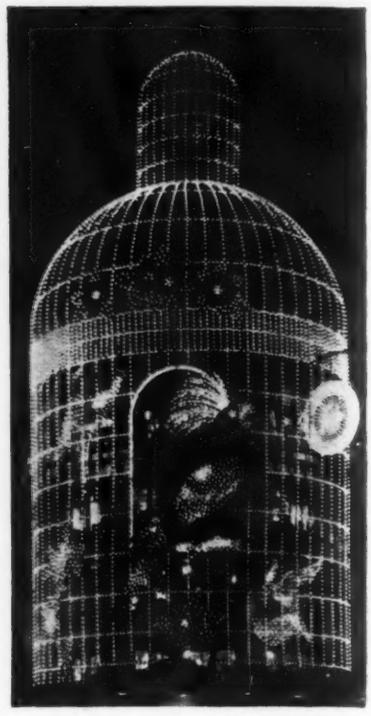
NORTH DAKOTA.—Imposition of a 6 per cent tax on the gross receipts of power and gas companies within the state is provided in a measure introduced last week.

OKLAHOMA.—A Senate bill defining the authority of the Corporation Commission, fixing rates to be charged by public utilities under municipal franchises and prohibiting the commission from changing franchise rates except in certain cases has been favorably reported. House bills introduced would prohibit utility merchandising and require uniform electric schedules where more than one town is served.

OREGON.—Under the provisions of a House bill no utility may enter into a contract for building plants or extensions to cost more than $25,000 without first submitting plans and specifications to the Public Service Commission. The utility shall then advertise for bids in such manner as may be determined by the commission and shall let the contract to the lowest responsible bidder. No contract shall be allowed where bidders own or control stock in the utility. Another bill requires a permit from the commission before utilities sell bonds, stocks or other securities. No such permit shall be granted for security issues of greater value than the original physical value of properties as established yearly by the commission.

PENNSYLVANIA.—Governor Pinchot won again in the House on Monday

A PARISIAN IDEA



Herbert Photos Inc.

This eight-story birdcage helps to brighten the shopping district in Paris in the winter evenings.

▼

night, when a resolution approving the Senate's investigation of the Public Service Commission was defeated by 133 to 70. Representative Moore introduced a resolution for an inquiry by seven members of the House and three outsiders to be named by the Governor and who would sit but not vote. In the meantime the Senate judiciary committee went ahead with its hearing. John Fox Weiss, counsel to the commission, the first witness, expressed the view that the commission, though abundantly able to do its work, "should be more searching in the public interest." He said the commission served both the public and the utilities and had not been subjected to improper influences by the latter. Governor Pinchot, answering an invitation to testify, threw doubt on the sincerity of the investigators and propounded eleven questions for them to seek answers to. These concerned chiefly comparative rates, utility profits, outside control and political activities. Subsequently Governor Pinchot agreed to appear before the Senate committee next week, its members protesting their sincerity, and the Speaker of the House delayed appointing rival investigators, although the Moore resolution had been passed.

TEXAS.—The first two bills to establish a public service commission differ in that one, introduced in the House by A. P. C. Petsch, would grant regulatory powers to city and county governments as well as to the state body while the other—that of Senator T. J. Holbrook—vests full authority in the latter. The Senate bill provides for three commissioners to be appointed by the Governor and approved by the Senate. Each would receive $10,000 a year.

WISCONSIN.—A resolution has passed the Senate by 24 to 2 which provides for a referendum at the November election, 1932, on lifting the 5 per cent debt limitation on municipalities so far as acquisition of public utilities is concerned. This resolution passed the 1929 Legislature, and since the Assembly is overwhelmingly in favor of it, the referendum is fairly certain. W. J. Hagenah, Byllesby vice-president, estimates that it will cost Wisconsin at least $1,200,000,000 to put into operation the state and municipal utility ownership program sponsored by the administration and now before the Legislature. "In addition," he says, "the state will be obligated to spend $1,000,000 a day for maintenance, extension and other necessary expenses." He declares that the measures are without parallel anywhere else in the country. A joint resolution directing the Railroad Commission to submit a report showing the utility properties in Wisconsin which are controlled by the North American, Insull and Byllesby groups has been introduced in the Assembly.

Scattered Happenings in the Electrical Sphere

United States

FINAL ARGUMENTS in the investigation of the New Hampshire Gas & Electric Company and the Derry Electric Company by the New Hampshire Public Service Commission were made at Concord last week, Louis E. Wyman summing up for the state and attacking the companies because of their alleged domination by the Associated Gas & Electric System and R. G. Dodge and R. W. Upton defending the utilities as well-operated concerns receiving less than a fair return upon the amount of their invested capital.

IN A RADIO ADDRESS broadcast over 38 stations Martin J. Insull on February 11 told his hearers that the "power trust" is a myth and that "assaults on the electric power industry are in reckless disregard of immediate public welfare." Mr. Insull was subsequently contradicted by Representative La Guardia of New York City, who told a small outdoor audience in Washington that the Federal Trade Commission inquiry had exposed the "nefarious ramifications" of the "very prosperous and active" trust.

ONCE AGAIN the Edison Pioneers, assembled in the Hotel Astor, New York, and Thomas A. Edison, their one-time employer, from his winter home in Florida, exchanged greetings on February 11, eighty-fourth anniversary of the inventor's birth. His son, Thomas A. Edison, Jr., represented him at the gathering. William S. Barstow was re-elected president for a third term. Leavitt L. Edgar, R. R. Bowker, William I. Donshea and A. O. Tate were made vice-presidents, and Frank A. Wardlaw, Charles E. Estabrook and William H. Meadowcroft were re-elected as secretary, treasurer and historian respectively.

WITH REPRESENTATION from 31 leagues and eight subsidiaries, the fourth midwinter conference of electrical leagues, held annually under the auspices of the League Council and sponsored by the Society for Electrical Development, conducted a two-day session at the headquarters of the Electric Association, Chicago, recently, during which secretary-managers of leagues dealt with problems that affect their day-to-day activities. Samuel Insull, Jr., president of the Electric Association of Chicago, and C. E. Greenwood, commercial director of the National Electric Light Association, were the chief speakers.

Canada

BY NOVEMBER 1, 1936, the Quebec area within a radius of 30 miles of Ottawa will be supplying more than 500,000 hp. of electrical energy to the Ontario Hydro-Electric Power Commission, the Maclaren-Quebec Power Company having entered into a contract to supply 125,000 hp. from its plants on the Lievre River, now being completed at a cost of $30,000,000. The first block of this power is to be delivered by July 1, 1933, with increasing quantities each year until the full amount is taken. Transmission-line properties are in process of acquisition. The Gatineau Power Company has contracts, previously reported, which call for a maximum energy delivery of 380,000 hp.

TO PREVENT A POSSIBLE INCREASE in Winnipeg's tax levy for the year, the principle of imposing a utility tax on the city's hydro-electric system has been accepted for the first time since the municipal power system was established in 1909.

Coming Meetings

North Central Division, N.E.L.A.—Engineering meeting, Minneapolis, Feb. 23 and 24. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

Electrical Advertising Conference—Westinghouse Lighting Institute, New York, Feb. 25-27. E. A. Mills, New York Edison Co., New York.

New England Division, N.E.L.A.—Engineering Section, Hotel Statler, Boston, March 5 and 6. Miss O. A. Bursiel, 20 Providence St., Boston.

American Institute of Electrical Engineers—District meetings, Pittsburgh, March 9-13; Rochester, April 29-May 2. F. L. Hutchinson, 33 W. 39th St., New York.

Oklahoma Utilities Association—Oklahoma City, March 10-12. E. F. McKay, 1020 Petroleum Bldg., Oklahoma City.

Pacific Coast Electrical Association—Engineering Section, Fresno, Calif., March 11-13. K. I. Dazey, 447 Sutter St., San Francisco.

Illinois State Electric Association—Springfield, Ill., March 12 and 13. G. W. Schwaner, 205 Illinois Mine Workers Bldg., Springfield, Ill.

Artistic Lighting Equipment Association—New York, March 16. C. L. Benjamin, 420 Lexington Ave., New York.

Northwest Electric Light and Power Association—Commercial Section, Spokane, Wash., March 16-18; Engineering Section, Wenatchee, Wash., March 18-20; Accounting Section, Salt Lake City, April 13 and 14. B. Snow, 1208 Spalding Bldg., Portland, Ore.

Southeastern Division, N.E.L.A.—Vinoy Park Hotel, St. Petersburg, Fla., April 1-3. C. M. Kilian, 508 Haas-Howell Bldg., Atlanta, Ga.

Arizona Utilities Association—Biltmore Hotel, Phoenix, April 8-11. J. S. Arnold, 300 West Washington St., Phoenix.

Maryland Utilities Association—Lord Baltimore Hotel, Baltimore, April 10. D. E. Kinnear, 803 Court Square Bldg., Baltimore.

Missouri Association of Public Utilities—Excelsior Springs, Mo., April 16-18. F. D. Beardslee, 315 N. 12th St., St. Louis.

Southwestern Geographic Division, N.E.L.A.—Mineral Wells, Tex., April 21-24. S. J. Ballinger, San Antonio Public Service Co., San Antonio, Tex.

Electrochemical Society—Hotel Tutwiler, Birmingham, Ala., April 23-25. C. G. Fink, Columbia University, New York.

Ewing Galloway

Where Quality Is Paramount

Costs and efficiencies may be compared and offer the deciding factor in many production processes when the question of electrical methods and others are debated, but where quality dominates the situation the choice is seldom doubtful. This Herault furnace in the main plant of the Hughes Tool Company at Houston, Tex., is producing steel electrically, for here only uniformity of melt, high quality and full control of metal are acceptable.

EDITORIALS

L.W.W.MORROW
Editor

Sir Charles A. Parsons

EVERY branch of human endeavor has its episodes which rise in retrospect to the level of epoch-making discoveries. Such was the case with the determination of the astronomer's son in 1884 to supplant reciprocating motion in steam prime movers by pure rotary motion and thus conserve space, materials and fuel by utilization of higher speed. Watt's engine had attained high perfection at the hands of a chain of designers, but today only the older generation can recall the majesty of the massive Corliss engines. They are almost a vanished race, pushed behind a frontier aggressively advanced by the irresistible steam turbine.

Charles Parsons revealed his inventive genius at the age of eleven. Before 1880 he had perfected a four-cylinder epicycloidal rotary engine. His first turbine developed ten horsepower at 18,000 revolutions per minute. It was hailed as a technical success, and financial support was promptly provided to exploit it as an equally successful commercial venture. In 1903 the marine field was invaded, the *Turbinia* winning popular approval by attaining the record speed of 34 knots through the medium of its 2,300-horsepower turbines. Parsons thus gave the impetus to a revolutionary move to which he and others have continued to contribute until navies and merchant fleets nearly as much as the electric power industry have been given over to this means of propulsion.

Knighthood was awarded to the inventor in 1911, and a multiplicity of other honors from his government and his professional admirers have been bestowed upon him. Inventions in other fields than those of thermodynamics and mechanical engineering attest his versatility. His death at the age of seventy-six closes a fruitful and productive life that will be honored by posterity as one that unlocked the door to efficiency and speed on the seas and universal electrification on land.

Some recent trends in switchgear design

A NUMBER of papers presented recently on switchgear design are a clear indication of what the present trend is and what the near future will bring. It would seem that for heavy duty, either indoor or outdoor, the metal-clad type of switchgear, filled with either oil or gum compound, has a definite field. The recent American designs show great improvements over previous types—they are more finished, more modern and more American. The designs up to 12 kv. for indoor or outdoor service particularly give the impression of finished products assembled at the factory and shipped assembled, and the very recent 33-kv. outdoor switchgear shows a number of improvements over the first designs, being more compact and more accessible.

Present indications are that gum compound will be more popular up to 12 kv. and that oil will be necessary for higher voltages. But even for lighter duty and lower voltages a metal-clad type of switchgear is rapidly growing out of the experimental stage and becoming very popular. It is the so-called cubicle without any compound or oil. There is great activity in this field, numerous manufacturers continually bringing out new designs and finding new applications for these cubicles. To be sure, a great many of the designs are quite awkward, but, as was the case with the heavy-duty type, definite competent designs of various types will no doubt soon develop. A number of operating companies likewise are at work

on the design of standard cubicles best suited for their own purposes. There is a great field open for this cheaper type of switchgear, not only in the power house for auxiliaries or for low-capacity distribution stations, but also for industrial plants, office buildings, stores and similar places.

Not only is it possible to ship a single metal-clad unit assembled, but in a number of instances recently a complete group of switching with bus work—and in some cases a complete switching structure—has been shipped fully assembled. The enormous saving through avoidance of disassembly of the structure at the factory and reassembly in the field is obvious.

Symposium on co-ordination permits charting course

INDUCTIVE co-ordination of power and telephone systems to avoid, prevent, restrain and anticipate inductive intermeddling has been an active program for ten years. Much of the activity has been confined to executive and specialist channels. Bulletins and technical reports have been issued by the joint N.E.L.A. and Bell committee. Technical contributions have appeared in the form of professional papers. But the real story had hardly been told until it appeared in the form of a symposium of four papers and two pronouncements at the A.I.E.E. convention.

Now the various agencies concerned in the development of both systems have available a perspective treatment which should meet the needs of all, from executive to distribution operative. The risk from the beginning has been that zeal in doing what is independently best for one system alone may often lead to its adoption in place of a simple compromise that may produce best over-all results in both systems. Grounding, Y-connections, tertiaries, high-speed circuit interruption, phase unbalances—all these enter the picture from the standpoint of co-ordination. The director of power enterprises will be glad to know how far each of these factors enters to relieve or confuse the correlation of power service and telephone service so that neither will be adversely affected and both will advance at minimum cost.

This program of co-ordination is one of which the electrical engineering profession can justly be proud. Had it not been undertaken, many of the difficulties engendered by parallel proximity of the two systems would have been presented to the courts for an inadequate solution in an insensitive atmosphere. Precedents and inappropriate legal principles would have obscured the balance of technical and economic measures. The result might well have been strife and animosity. Instead, a spirit of amity and conciliation have made a sound engineering adjustment possible and certain. It is necessary only to capitalize the progress to date by insuring a wide dissemination of the comprehensive analysis just made available. Proper regard for the effect of independent trends and requirements in anticipating expansion programs will keep the two arts progressing in the mutually beneficent channels which have been established by the joint committee.

Executives decide to study trade relations

LEADERS of the electric light and power industry are preparing to face in earnest the facts of merchandising policy and take constructive steps to straighten out some of the causes of trouble in trade relations. The recent conference of high executives of the National Electric Light Association with a group of eminent men representing the National Retail Dry Goods Association and the National Retail Hardware Association has led to the formation of a joint electrical merchandising committee, as is reported elsewhere in this issue. This committee is to make a "survey and factual study" of present practices in the merchandising of household electrical appliances. Out of such a study should come clear evidence of what are good and what are bad methods of merchandising, what policies help create and develop the market and what policies hamper co-operation. It will embrace the activities of both the public utilities and the independent merchants. With such evidence spread out and analyzed it should not be difficult to see the way forward.

The promise of good lies not in the mere news that these three groups have talked it over. Utility sales managers did that several years ago in a

series of conferences between the N.E.L.A. Commercial Section and men from the dry goods, hardware, furniture and electrical trades in which the principles of fair merchandising practice were laid down. The search for facts might well have been made then to find out in how many cities these principles were recognized and applied. But nothing was done at that time because the matter lacked utility executive interest, and no effective effort was made to win the adherence of local utility organizations. Now, with such men as Jones, Owens, Sloan, Edgar, Gilchrist and Sampsell involved on the utility side and Filene, Kelly and Koch to speak for the department stores, this program becames a major issue. Because of the effect of trade relations upon public sentiment its importance is vital. It is encouraging to see a program now set up that should lead to light upon this controversial theme and to action that may end all argument as to what is or is not good policy.

Window-lighting opportunities

INTEREST in store window lighting can be enlivened in many ways, but few are more effective than personal inspections or photographic comparisons, backed by facts, where these are available, as to sales increases following the betterments of lighting. "Window shopping" is on the increase. Intensive lighting by day combined with the proper use of color and dressing is competing with evening illumination in drawing popular attention to displays.

The time is favorable for gathering brief data on the relation of window areas to total store space rentals in various classes of shops, for inquiry into the energy consumption of well-equipped windows and the ratio of electrical costs to other store expenses and revenues, and for a study of the possibilities of standardized wiring and fixture-unit layouts for different window sizes and applications. The portable fixture also has a place in the electrical sun, since many store owners will not pay for permanent improvements.

Few store owners who pay from 3 to 6 per cent of their rent regularly in newspaper space neglect to use that space effectively, and the economic value of properly lighted windows is correspondingly impressive.

Governor Pinchot craves costs of distribution

DURING the closing sessions of the winter convention of the American Institute of Electrical Engineers President W. S. Lee received a long telegram from Governor Pinchot of Pennsylvania in which he asked for discussion of the costs of electrical distribution. President Lee in reply called attention to two misconceptions on the part of the Governor. Contrary to the latter's assertion that "about distribution . . . there is not a word; the subject has never been discussed before any engineering society, local or national," hardly any A.I.E.E. committee has made more prolific contribution to electrotechnical literature than that on transmission and distribution. And as for dearth of information in the files of the regulatory commissions, the Governor again is wrong, or should be; the classified accounts reported by the utilities to the commissions present the basic facts for allocation of distribution costs.

Every rate case and every rate approval provide the opportunity for critical scrutiny of the assessment of costs to each class of customer. It is within the prerogative of the commission to pass over such detailed analyses of specific cost as less imperative than the fixing of an adequate over-all return consistent with the recognition of the competitive and promotional features which affect various classes of customers differently. But rate regulation contemplates such detailed scrutiny.

Distribution costs, however, are not readily allocated. Arbitrary assumptions have to be made in every case. No two systems or sections of systems are wholly alike. Generalizations are hazardous. Even the assumptions have to be modified to meet seasonal, annual and unexpected shifts in the load characteristics which determine the allocation.

The Governor went to the wrong fountain for his drink. Principles of cost allocation are proper subject matter for an economic society or an industry organization. Influence of theory, design and operating practice on system costs are appropriate for a professional society's program. But specific costs attaching to any specific class of customer in a particular property at a particular time and under particular circumstances of loading, taxes and money rates are a matter between the utility in question and its appointed guardians.

Interlocked Elevator Control Prevents Costly Choke-Ups

By RALPH WALTER

Research Engineer Fisher Flouring Mills Company, Seattle, Wash.

High-speed automatic bulk handling of grain.

Visible signals show all operating set-ups.

Grain flow automatically shut off in case of choke-up.

Interlocked motor control circuits prevent starting grain flow until all spouting is properly set and all machinery is in operation.

ALMOST every conceivable contingency has been guarded against in the elaborate electrical control for the conveyor and grain handling system in the new No. 3 elevator of the Fisher Flouring Mills Company in Seattle. In handling grain at the rate of 8 tons a minute an interruption of flow anywhere along the route means a large acumulation of grain in but a few seconds. If not taken care of immediately a dangerous fire hazard is created, not to mention the laborious task of cleaning up the spilled grain.

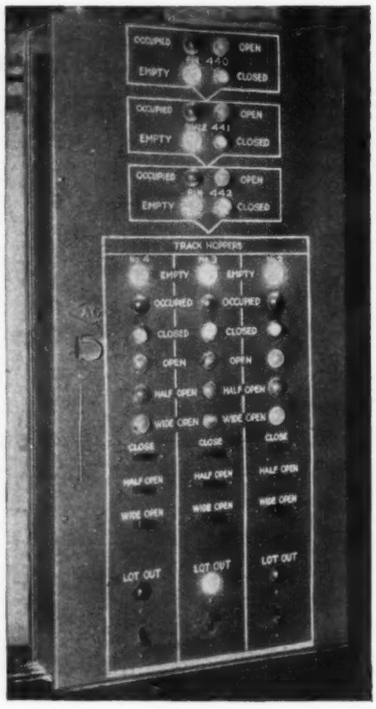
In the No. 3 unit it was decided to accomplish three things which, as far as is known, have never been attempted before in elevator construction and operation:

1. To provide a visible indication of all operating set-ups so that supervision could be had at one point.

2. To eliminate hazardous and costly choke-ups by providing automatic means of shutting off the grain flow immediately at the source should a choke-up occur anywhere in the system, or should any piece of equipment fail to function.

3. To interlock the controls in such a manner that unless all machinery to be used in a set-up was running and the slides and valves were properly set, it would be impossible to start the flow of grain.

Visible indication of all operations was provided by the signal board shown in one of the accompanying illustrations. This is really a flow diagram of the No. 3 grain storage unit. The upper section of the black squares and circles represents the top plan of the grain storage bins, showing the conveyor belts and spouts leading to them. The lower section of squares and circles represents the basement plan below the same bins and shows the conveyor belts and spouts leading from them. The left section shows the many different routes over which grain may be directed from the track hoppers, along conveyors, up elevators, through trolley spouts, and ultimately into the various bins.



State weigher's signal board

Colored lamps show which bins and hoppers are empty or occupied and position of valves.

The actual board measures 42 x 56 in. In the open circles are mounted small electric lamps of various colors. Each lamp indicates the position of a grain valve, belt tripper, or trolley spout, or shows whether a conveyor or elevator is running, whether a bin or hopper is empty or occupied, or whether grain is flowing in the system. Thus the grain dispatcher can trace at a glance the flow of grain completely from the unloading hopper through the system and see to just what bin it is being delivered. In like manner the flow can be followed clearly when grain is being drawn from No. 3 storage unit and delivered to No. 1 or No. 2 storage units, to milling bins, to processing machines, to ships or railway cars, or is being returned to another bin in No. 3 storage unit. Thus the grain dispatcher can check the set-up before he authorizes the movement of grain, in this way preventing mistakes.

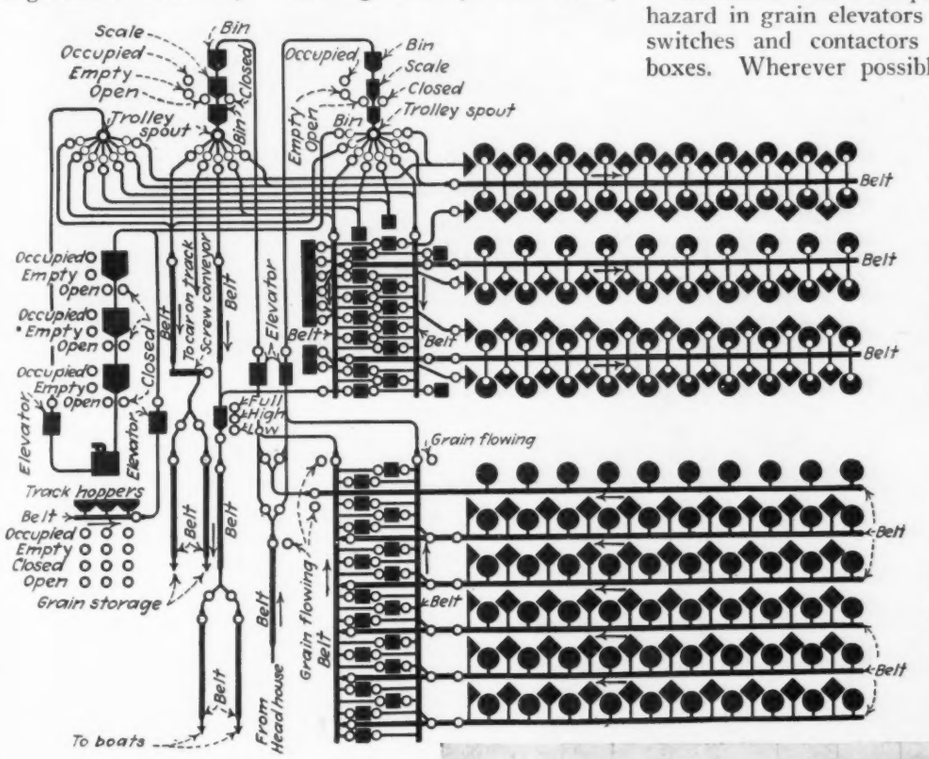
A smaller signal board, which gives all information needed by the state weigher, is located beside the receiving scales. Still another board is mounted near the unloading hoppers for the information of the unloading foreman. These signal boards supplement telephones which connect all points in the grain department.

To operate the signal system, electric current is obtained from an individual 110-volt transformer with ungrounded secondary. The signal lamps are 5-volt, radio panel lamps, operating on 110 volts through a resistor. This low voltage was chosen to eliminate contact troubles. Two small "ground lamps," mounted on the board and wired in series across the line, indicate a ground anywhere in the system, which can then be eliminated before causing trouble.

Control of the indicating lamps, showing positions of valves, slides and belt trippers, is effected by momentary-contact flush toggle switches, mounted in dust-tight boxes and actuated by plungers. To develop a special switch for indicating lamps required considerable study and experimenting. This device, which is called a "choke-up" switch, consists of a mercury tube contactor, mounted in a dust-tight box and operated by grain pressure against a rubber diaphragm. The rubber allows sufficient movement to operate the switch, yet keeps the mechanism free from dust. Lights indicating running machinery are operated by relays connected in the motor control circuits.

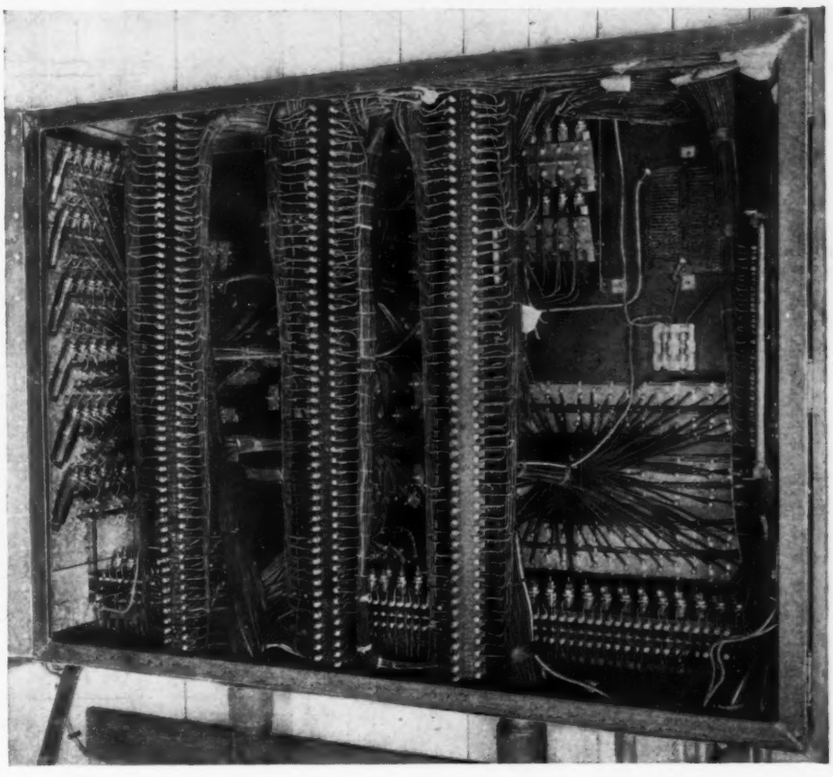
Because of the ever-present fire and dust explosion hazard in grain elevators it was necessary to design all switches and contactors to operate within dust-tight boxes. Wherever possible, use was made of mercury tube contactors, which do not present this hazard, but even here, for added safety, all switches were fully inclosed in dust-tight metal boxes.

To eliminate the fire hazard caused by choke-ups required the use of remote-controlled, quick-closing grain valves, operated by electric switches that would function whenever grain reached a dangerous level



Grain dispatcher's indicating board

Small colored lamps, indicated by the open circles, show when a belt or elevator is running, indicate position of a trolley spout, belt tripper or grain valve, or show when a bin or hopper is empty or occupied.

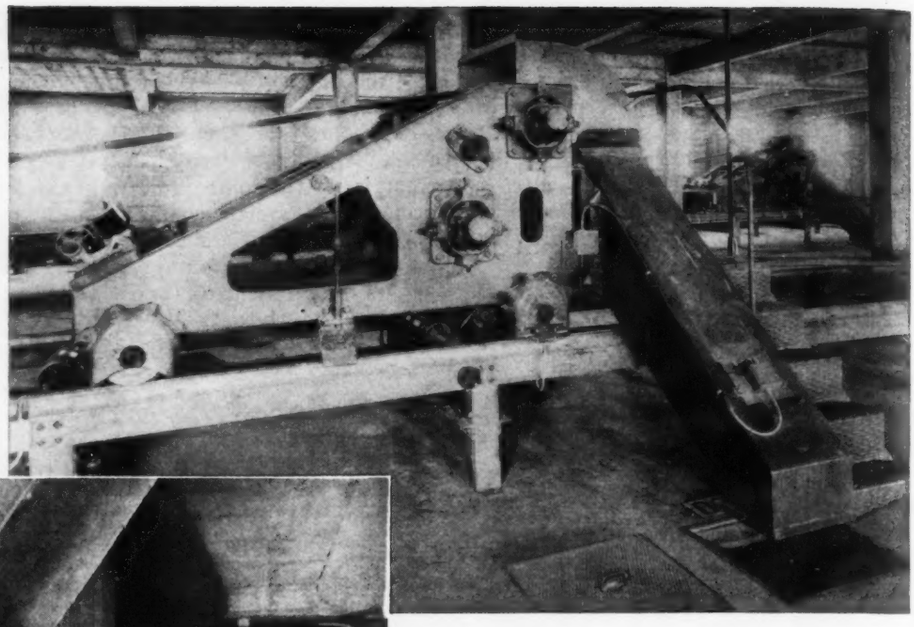


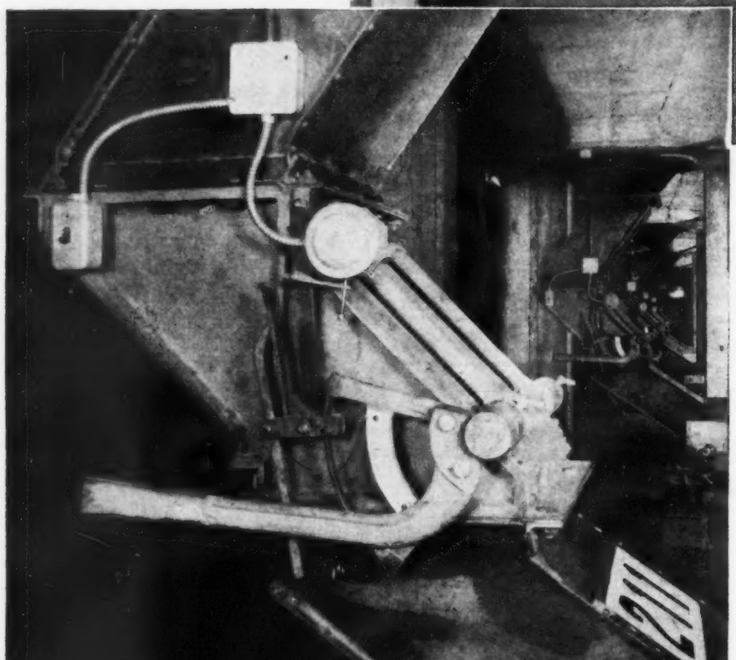
Distribution cabinet for indicating board

In this cabinet are the many terminals, all labeled, and the lamp resistors and test switch for testing all signal lamps at one time. Over 25 miles of special signal wire was used for the complete installation.

Grain belt tripper

These machines receive grain from the conveyor belts and discharge into the various tanks. A full tank operates the choke-up switch on discharge spout, stopping the conveyor and all equipment delivering to it. A shoe attached to the tripper wheel guard shows position of the machine on the grain dispatcher's indicating board.





Quick-closing grain valve

These solenoid-released valves close automatically in case of a disturbance anywhere in the system affecting the grain flow. They may be closed also by remote control should the operator wish to shut off the flow.

in any piece of equipment, spout or bin, or when a choke-up occurred in the system for any cause. As there were no devices of this nature on the market, it was necessary to design and build them. The outlets to all grain bins are equipped with this type of gravity-closing valve, held in open position by an electric solenoid, which is released either by operation of a choke-up switch (previously described) or by a power failure.

Every elevator is protected by a choke-up switch mounted in the elevator head and another at the boot. All conveyors are protected in like manner, as also are all belt trippers. In fact, these choke-up switches are placed in every location where a choked condition might occur. On all branch valves, slides and trolley spouts electric switches are so arranged that the control circuits are tied through them and connect the choke-up switches with the grain valves that are in use. In this way a choked condition anywhere will shut off the proper grain valve, but will not interfere with any other set-up that may be in use at the same time.

The interlocking system was designed to prevent the starting of any piece of machinery unless the equipment to which this machine delivers is properly set up and running. This system makes it impossible to start a flow of grain unless the set-up is complete and all machinery in operation.

Should a grain bin fill to the top, the choke-up switch on the belt tripper spout would open the control circuit, which shuts down the conveyor belt. As soon as power to the conveyor is cut off all control tied in through this belt is shut off immediately. The control circuit for each piece of equipment is wired through a relay, which in turn obtains its current from the motor control circuit on the machine to which the first piece of equipment delivers.

A power failure anywhere in the system will immediately shut off all equipment delivering to the point of failure, except the elevators. All elevators have been designed with sufficient capacity at the discharge end to hold the amount of grain already in the elevator cups when the flow is shut off. In this way it is never necessary to start a loaded elevator.

As was previously mentioned, all control circuits tie through the trolley spouts. Should a trolley spout be moved from position, the control circuit would be broken and all equipment feeding to this spout would automatically stop. To enable the operator to change the spout without stopping all machinery, a "tie-through" switch has been installed beside the spout. When the operator wishes to change a trolley spout he closes this switch, which ties the control through, while he changes

to another location. A horn blows while this switch is on to notify the operator that the control is by-passing the trolley spout.

Should the operator by mistake set two trolley spouts to deliver to the same location a time delay functions in 30 seconds and shuts down all machinery affected. This delay is necessary to enable the operator to move a spout over a location then occupied by another spout without shutting down the equipment operating through the other spout.

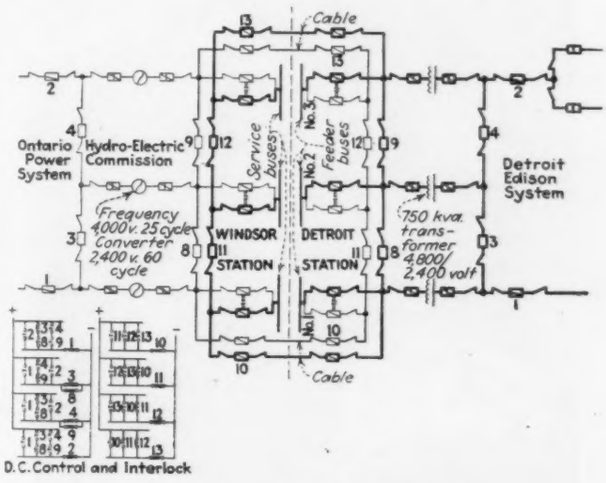
The grain valves both above and below the receiving scale are so interlocked that it is impossible to mix two lots of grain. First, it is possible to open but one track hopper at a time. Then the valve above the scale cannot be opened to admit grain to the scale unless the scale hopper is empty and the valve below the scale is closed. Likewise, it is impossible to open the valve below the scale, unless the valve above is closed and the bin below is empty and its discharge valve closed.

All operators, however careful, are human and likely to err sometime when handling grain. With these interlocking features it is practically impossible to make a mistake. No piece of apparatus will function unless operated in the proper sequence. This interlocking control and indicating system has been in operation for several months and has given almost no trouble at all. Many times all the machinery has been shut down and could not be started; then the operator would call the electrician to fix the trouble, only to find a bin full to the top, a trolley spout set on the wrong belt, or some similar mistake or oversight which would have caused serious trouble had the machinery continued to run. The operator need not give thought to the system, for all switching and connecting are done automatically. If he sets a tripper or trolley spout in a given location, it automatically connects through the interlocking system and indicators at the indicating board.

In eliminating unnecessary wear and tear on the machinery, in preventing possible mix-ups of grain, and in doing away with the dangerous fire hazard caused by choked elevators, not to mention the mental relief afforded all concerned, it is believed this installation marks a decided forward step in elevator design and operation. Moreover, many features of this system might advantageously be applied to other bulk-material-handling problems.

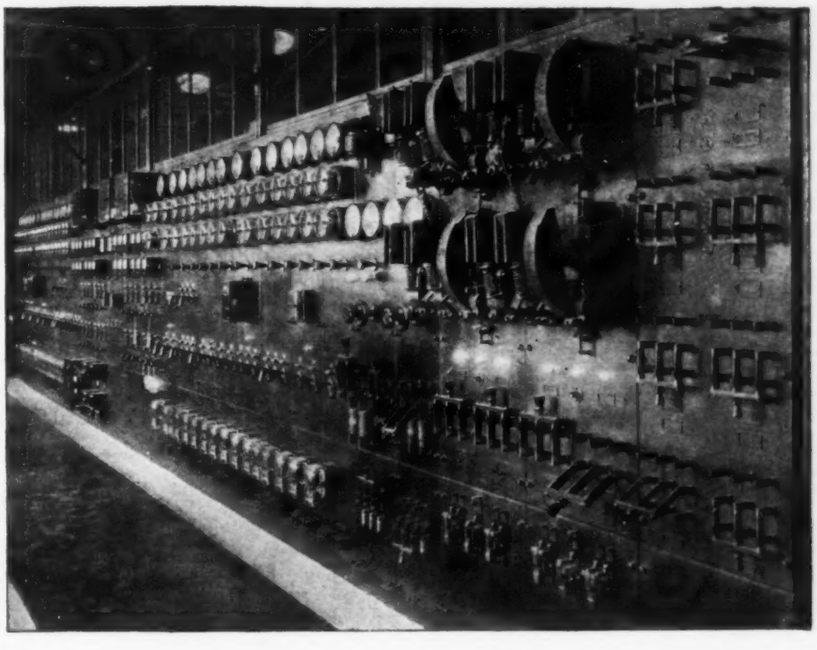
Duplex Service Insures Tunnel Operation

Electricity from two systems, one in Canada and the other in the United States, assures continuity of service to the mile-long international vehicular tunnel under the Detroit River, uniting Detroit, Mich., and Windsor, Ont. More than that, from each system are



Service assurance by duplication

The interlock scheme prevents paralleling of lines or tying the two supply systems together. The numbers in the interlock diagram refer to switches so numbered in both the Detroit Edison and the Hydro-Electric Power Commission of Ontario supplies. Thus in either system closing switch No. 2 will open No. 1 and vice versa. No. 3 may be closed, but closing No. 8 while 3 is closed will open No. 1, and the same with 4 and 9. If 3 and 8 are closed, closing 1 or 2 or 4 and 9 together will open both. The rest of the scheme is apparent from the diagram.

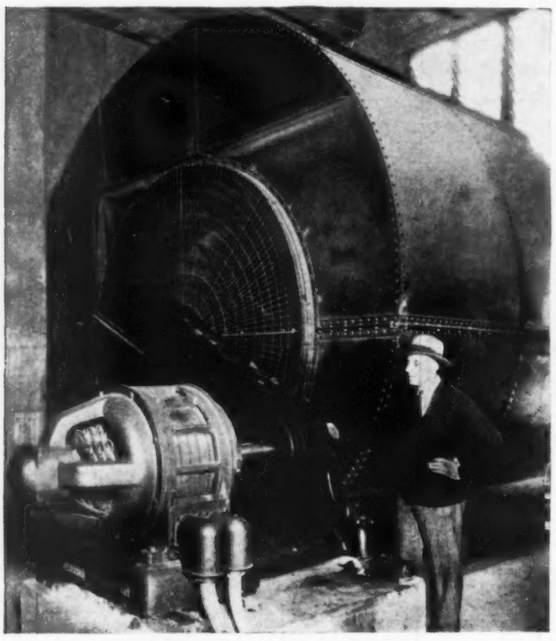


Main control is at the Detroit tunnel end

This board controls the entire electrical operation of the tunnel. Control of the Windsor equipment, however, may in emergency be taken over by another board at that end.

two sources of energy supply, so interlocked that one of each pair must always be in reserve. And yet more, one of the sources on the American side is a loop that may be fed either way. Thus there are actually five possible supplies of energy, any one of which could carry the load in an emergency.

In each of the two ventilation buildings at the tunnel ends are six blower and six exhaust fans, 24 in all. To insure that there be no failure of supply to the fan motors is the reason for the completely duplicated electrical installation, elaborate with mechanical and electrical interlocks. The installation has already had the test of service. Shortly after the tunnel was opened one of the sources failed, but no one except the operators knew it until the local newspapers gave it publicity as an instance of the perfect operation and safety of the tunnel. Other short interruptions of the Canadian supply have proved the reliability of the protective and throw-over devices.



The fans must not stop

The tunnel is divided into four ventilation sections, under ground and under river, in the Detroit and Windsor halves. The two underground sections, end sections, have each three blower and three exhaust fans driven by 30-hp. motors. The Detroit River section has three blowers and three exhausts driven by 100-hp. motors, while the same number of fans for the Windsor River section, somewhat longer, require 150-hp. motors. All fan motors are individually controlled with ranges of one-half, three-quarter and full speeds.

Within the area of service to the tunnel the Detroit Edison lines are underground and comparatively short. Of the two sources from the system of the Detroit Edison Company one is a loop tap, actually equivalent to two lines. Through systems of duplicate buses in each ventilation house and cables through the tunnel, as shown by the diagram, either source from either system may supply the whole load. In normal operation the load is shared at both ends by the two systems. An arrangement of interlocks prevents paralleling the two systems and prevents also paralleling the two sources in the individual systems.

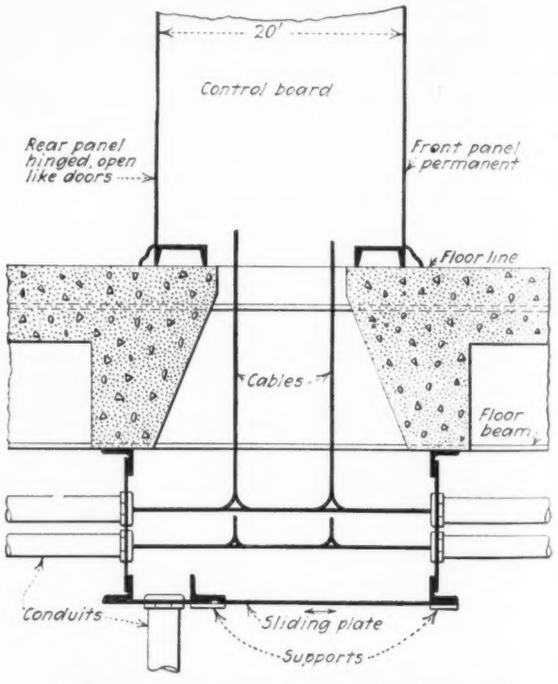
Accessible Cable Trenches

By F. J. DOUGLAS

J. G. White Engineering Corporation, New York

Cable trenches which afford accessibility from the bottom side have been necessitated by the new type of back-to-back control boards which are constructed with only 20 in. between the front and rear panels. A new type of cable trench for these boards, having removable plates on the bottom, affording accessibility from below the floor line, is shown in the accompanying figure. The trench walls from the floor to the bottom of the beams are of concrete.

Under the floor beams steel sides and bottom are provided, with the sides and parts of the bottom being permanently fixed in place. The greater portion of the bottom consists of removable plates which give access to the trench for cable pulling and other installation or inspection work. The remaining portion of the bottom is a fixed plate having openings for conduit and the sides also have openings for conduit so that the cables may be brought up through an open slot in the floor either to the front or rear panels, as required. Cross barriers can be provided in the trench at any desired location, either on beam or panel joint lines. The removable plates are arranged to slide in place in sections, requiring no set-screws. A small bolt can be provided at the end of each plate to prevent it from being worked out of place by vibration in the floor.



Cable trench permits installation and inspection from bottom

This cable trench is designed for use with the modern back-to-back steel control board. Removable steel plates provide opening in bottom.

Promoting System Security by Prompt Sectionalization

The present creed of system operation stresses the prevention of trouble rather than the methods of dealing with it. The system operator should decide to sectionalize promptly when troubles of unknown origin do not clear immediately

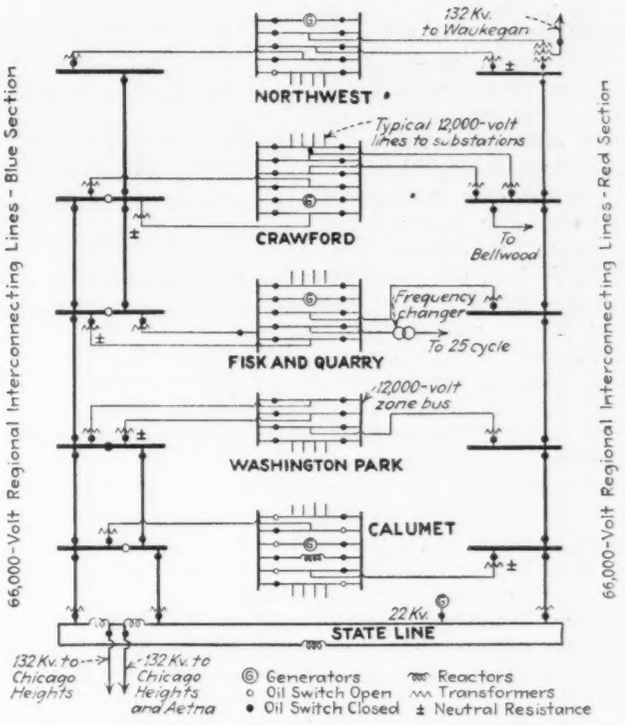
By P. B. JUHNKE

Chief Load Dispatcher Commonwealth Edison Company, Chicago, Ill.

TO PREVENT trouble should be the load dispatchers' slogan. It is less spectacular than to fight it, it is true, but is vastly more profitable. Prevention of trouble should be broad in scope. Breakdown of apparatus cannot be prevented, but by carefully planning system operation the load dispatcher can definitely circumscribe its ill effects. The load dispatcher who can keep his system free from trouble is superior as a tactician to the man who can brilliantly combat it.

Each generating center should be so kept that trouble will affect only the smallest possible part of it, and that part may never be more than one-half. While fault buses are designed to cut out defective sections, bus failures must still be taken into account. In these emergencies the maintenance of a part of the center is most important. Where it is feasible to do so, it is highly desirable to keep the generating center permanently split into sections, through reactors or sectionalizing switches, so the trouble will be definitely limited or that the chances of its spreading will be kept at a minimum.

In a purely distribution center of major size a like precaution is advisable for the transmission units that are the supplying elements. The principle of keeping supply lines out of parallel on the high-tension side and tying them only on the low-tension side is well worth while. It provides reasonable assurance that all supply sources will not be lost at the same time, as they are not, when so operated, apt to be involved in trouble of the kind that cripples a whole station or center. If the secondary side can employ a sectionalizing scheme, or what is sometimes termed loose coupling, the chances are



Sectionalizing possibilities in the Chicago system

reasonably good that the supply to such a center will not be entirely interrupted. With a duplicate bus system available, the restoration of service is quick, and, what is more important, the trouble does not become general.

In all load dispatching the prime consideration must ever be security of operation. This is the cardinal principle upon which the operating plan is built. Upon this as a basis rest the following considerations:

1. Relative efficiency of individual stations.
2. Responsibility resulting from loss of largest generating unit running.
3. Responsibility resulting from loss of largest transmission element.
4. Responsibility resulting from loss of portions of largest transmission and distribution centers.

In any large system there is very little difference of opinion in regard to the functions to be allotted to the most efficient stations. The various responsibilities, however, vary widely. In the Chicago area, for instance, the largest unit is that of the State Line station, having a

total capacity of 200,000 kw. The unit consists of one 80,000-kw. high-pressure and two 60,000-kw. low-pressure elements. The two low-pressure elements may function without the high-pressure element and are able to generate 120,000 kw., or else the high-pressure and one low-pressure element may function and generate 100,000 kw. As any one element may be lost without taking the others out of service for more than a few seconds' interruption to the entire supply, the greatest interruption responsibility may be taken only as 100,000 kw. This responsibility and the consequent system reserve entailed thereby can further be reduced in proportion as the total load of the station is below the full 200,000 kw. For instance, when the station carries only 175,000 kw., the responsibility is only 75,000 kw., as in any event the loss of a low-pressure element will still enable the unit to function at 100,000 kw.

In the case of Crawford station, with its total rated capacity of six units and 424,000 kw., the situation is somewhat different. Here the largest unit is 100,000 kw., and this is the largest responsibility entailed by the loss thereof. When the station, with all units running, carries a load below rated capacity, the largest responsibility resulting is reduced a like amount.

In the case of the lines from Powerton station, a total of approximately 70,000 kw. is transmitted to Chicago. As this, however, comes over two 130,000-volt lines, practically no responsibility attaches itself to this, as one line can well carry the entire load.

The Waukegan contribution of 45,000 kw. is at present still transmitted over one line, the loss of which imposes a responsibility of like amount. This line will shortly be duplicated, so that this responsibility will largely disappear until the loading from Waukegan is materially increased beyond 80,000 kw., the capacity of one line.

Fixing the system reserve

To maintain a safe condition—that is, capacity to meet the loss of the largest block of power—requires a reserve in generators and boilers or the equivalent up to 85,000 kw. as long as the State Line load is held at 185,000 kw., and from this down to very much smaller values, depending on the period of the day and the load carried by the station. There is instantly available to the system a battery reserve in excess of 35,000 kw. during the greater part of the day, and for this reason the actual steam reserve necessary is only about 50,000 kw. Actually, an excess of this amount is maintained, as follows:

	Kw.
State Line	15,000
Crawford	20,000
Fisk-Quarry	35,000
	70,000

To this might be added 15,000 kw., which the Public Service Company of Northern Illinois aims to maintain in its stations. It should be borne in mind that in the event of the loss of one of the elements of State Line station the reserve capacity of this station also disappears.

In this need for reserve lies justification for not running even the most efficient stations at full load, provided the differential between them and other stations is not too great.

In order that a station may function as available reserve it must have an appreciable amount of load on which to build a steam reserve, for banked boilers cannot respond liberally, and the station operating below but near capacity should be best equipped to supply a sudden deficiency.

There are positive advantages connected with not operating in parallel, and these are not always appreciated. The rising unit cost of system structures is largely the result of endless paralleling of capacity, with the correspondingly increased rupturing responsibility. An analysis of the cost of this responsibility balanced against the advantages of parallel operation of all portions of large systems might be of considerable interest

Large system structures become complicated by the multiplicity of elements not exactly identical in details. An inequality in supply lines per bus constitutes a difference in impedance between the supplying stations and the different buses. This inequality is aggravated by the fact that the supply lines at originating stations are also being supplied by an unequal number of transformers. The result is that some transformers are fully loaded long before some others. This brings about a material reduction in the rated capacity.

This condition can be modified as between different lines and transformers by such operations as changing the generating capacity on the different bus sections in the supplying stations. In strictly technical parlance, the load dispatcher must adjust impedances in different circuits to their respective carrying capacities, and that with apparatus never intended in the original design for such a purpose.

The question frequently arises as to how far a company should go in safeguarding the service. Generally speaking, in view of the relatively high reliability of electric apparatus, it is questionable if ever more than 10 per cent of generating capacity is required, except in those cases where the size of the largest unit running exceeds that figure. In that case the reserve should equal the largest unit of generation or transmission, or, at least, the load carried by them. In the case of transmission lines with reasonable routing diversity, one line in a group of five or six would be considered ample. To go beyond these values puts a burden on the company, and therefore, in the last analysis, on the public, which may not think it warranted, for a tremendous share of our progress rests on cheap power, reliable according to accepted standards, but not foolishly refined.

Sectionalization of systems, partial and complete

By partial sectionalization is meant the keeping of the system in such manner that the opening, either automatic or manual, of very few switches or interconnections will disconnect a considerable section from the rest of the system. Partial sectionalization is a state or condition very desirable in the large system, where trouble not

arrested in its earliest stages might envelop the entire system, making restoration of service very difficult.

In the Commonwealth Edison Company this condition is maintained in those generating, transmission and distribution centers where a complete fault bus system is not available. But where a fault bus, complete in every respect, is present, partial sectionalization has no place.

A good example of partial sectionalization in the Commonwealth Edison Company is represented by the 66,000-volt transmission center at Fisk Street. This center is equipped with a fault bus system, but not so complete as is desirable. Each transmission line has only one oil switch, with switches to the main and auxiliary buses. Such a fault bus has the advantage of very quickly disconnecting the faulty bus, but in so doing interrupts the supplying lines, a disadvantage not encountered with a complete fault bus.

In view of these limitations, the center is operated as if no fault bus existed. Each 66,000-volt line, bus and transformer forms a unit, with the disconnectives open on the bus tie switches, to minimize possibility of trouble spreading from one 66,000-volt bus to another. Of course, all three sections are paralleled on the 12,000-volt side, where, however, a full fault bus installation functions. In the event that this should fail from any cause and the short-circuit current should reach sufficient dimensions, then automatic sectionalization would become effective and split the 12,000-volt bus into two sections, each having half of the load of the center connected to it.

By complete sectionalization is meant the splitting of systems into sections out of parallel with each other. Complete sectionalization is highly desirable in cases of trouble of unknown origin. Such sectionalization is the quickest means of isolating such trouble, permitting the section free thereof to function normally. There are various causes that may make sectionalizing desirable, such as:

1. Oscillations between stations, with consequent fluctuations in pressure in all parts. Cause sometimes unknown.
2. Relay failures, permitting faults to persist.
3. Bus short circuits in stations, and not cleared automatically by fault bus or other means.

All of the above causes are not always quickly detected, and this fact, more than anything else, makes sectionalizing at times imperative.

Complete sectionalization, automatic or manual

The former has many decided advantages. It is more positive. It can be predetermined fairly definitely. There is no hesitation about relays to function at current values for which they are set. Manual sectionalization brings in the element of doubt. Is it desirable or not to sectionalize? This element is always present, because parallel operation is considered a normal condition; the sectionalized state is considered abnormal. Why should this be? Should large systems, composed of several generating centers, necessarily run in parallel? There is no dogma to this effect which must be accepted as infallibly right. If the generating centers are self-sufficient—that is, if they can satisfy their local loads and in so doing employ themselves fully—the need for parallel operation with other centers largely disappears. Of course, it means that any one unit in such a station must be a reasonably small fractional part of the whole, so that a station can contain within itself the necessary reserve against loss of its largest element.

There are positive advantages connected with not operating in parallel, and these are not always appreciated. The rising unit cost of system structures is largely the result of endless paralleling of capacity, with the correspondingly increased rupturing responsibility. An analysis of the cost of this responsibility balanced against the advantages of parallel operation of all portions of large systems might be of considerable interest.

The foregoing is not a plea seriously to consider permanent sectionalization of systems into component parts, as the economies incidental thereto are incontrovertible. It should, however, strengthen the load dispatcher and system operator in his determination to sectionalize promptly in cases of unknown trouble that does not clear itself immediately.

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Visual Work and Defective Vision

By M. LUCKIESH

Director Lighting Research Laboratory, General Electric Company, Cleveland, Ohio

The effect upon the eyes of critical visual work can be traced by examinations from time to time. The eyes of the human infant at birth are influenced by hereditary factors and are still free from the environment defects produced by the abuses of modern civilization. The result of many examinations of the eyes of infants establishes the fact that such eyes are naturally hyperopic; that is, far sighted. In other words, the eyes have evolved to function best for distant vision. The normal eye, by an involuntary adjustment of the ciliary muscle which alters the convexity of the crystalline lens, is enabled to compensate for the natural clean-sighted condition. For normal eyes the muscular strain produced by accomplishing this correction is not unduly severe and may be maintained for years without detriment to the eyes.

As the child grows older the eyes are used to an increasing extent for critical near work. It is significant that cases of myopia, or near sightedness, begin to increase in frequency. The development of myopia is attributed to excessive use of the eyes, improper use of the eyes, improper lighting, inadequate illumination or to a combination of these causes. There are also pathological causes. However, in the case of the myopic eye, there is no internal compensating mechanism for correcting this condition as there is for the hyperopic eye. Myopia results in serious drains upon the energy resources of the human machine.

The progressive character of myopia with age is indicated in the following table:

	Number Examined	Percentage of Eyes: Emmetropic (Normal)	Percentage of Eyes: Myopic (Nearsighted)
Infants	1,534	6.2	2.5
Pre-school children	356	10.4	7.9
Elementary school children	13,929	63.6	11.4
Intermediate school children	42,283	37.4	27.5
College students	4,207	37.9	52.5

These data indicate that myopia is rare in infancy, but increases steadily with advancing age and use of the eyes

for near work. An analysis of defective vision among college students indicated that myopia increased about 2.5 per cent per year for each year of college life.

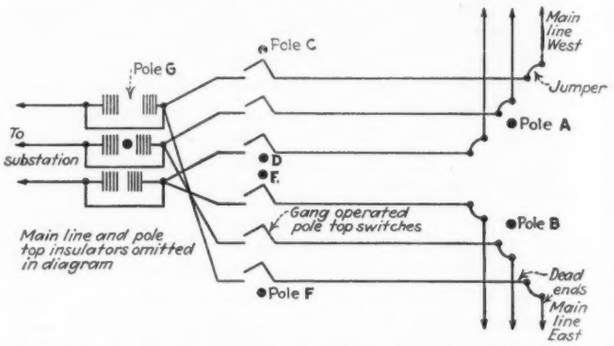
Although much scientific study has been given to these defects of vision, no method has been developed to prevent or cure the errors of refraction caused by the demands made upon the eyes. However, it has been established that the seriousness of these errors can be minimized by the use of good lighting. The lighting specialist who develops into a seeing specialist has the opportunity to do much in conserving vision and increasing the productiveness and happiness of human beings.

▼

Inexpensive Substation for Loop Tap

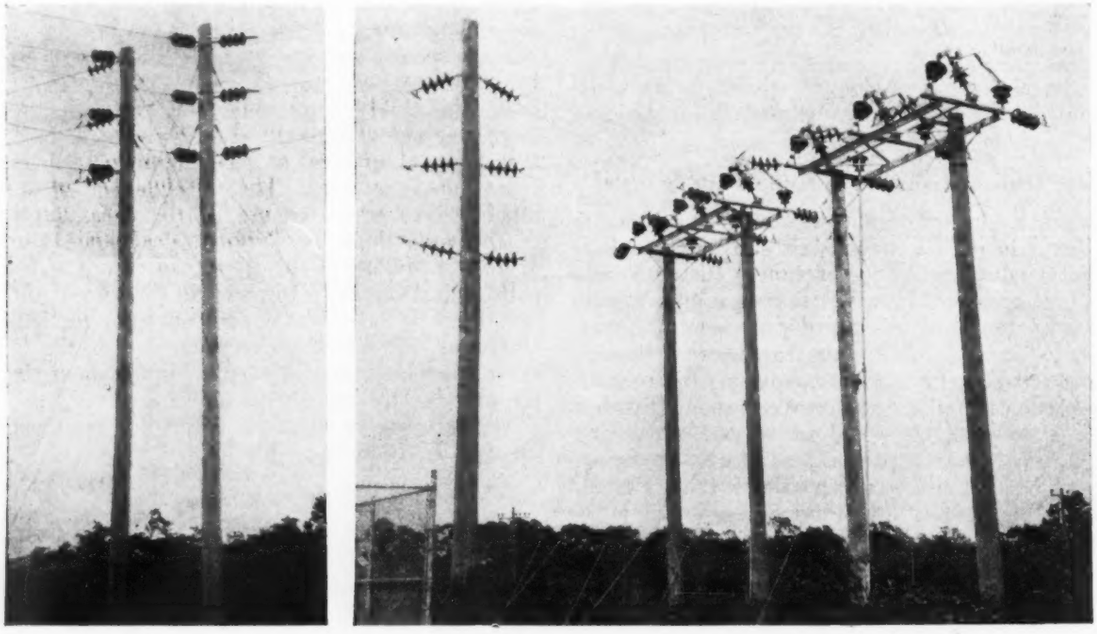
Simplicity of design, a minimum of material and flexible operation are featured in a recently constructed substation loop connection with the main line of the Cape & Vineyard Electric Company at Santuit, Mass. The main line forms a 22-kv., three-phase loop from the Cape Cod Canal through Falmouth to Hyannis and back through Sandwich, and can be sectionalized on either side of each loop substation to permit quicker restoration of service in case of trouble. Isolation of any section of the main loop enables the local substations to be energized from the other side of the ring.

At Santuit each incoming phase wire from the west terminates on a four-disk insulator bolted into a single pole, and by jumper a right-angled turn is made on the same pole toward the substation, the tap being dead-ended at another four-disk insulator. The incoming line from the east is similarly disposed of on a second pole. Four guys per pole are provided to offset the pulls of the incoming line and taps, and the poles are also cross-tied near their tops. The two sets of tap wires, three per phase, carry the circuit through two sets of pole-top disconnecting switches carried on channel-iron frames on two pairs of poles near the substation, and are brought together in one V-connection per phase at a seventh pole just outside the substation yard. These



Scheme of looping line past substation requires only two sets of pole-top disconnects

V-connections are made on four-disk insulators on the line side of the pole, and from these points jumpers tap the feeding-in loop and serve short connections to the substation bus structure. The pole-top switches mentioned are normally closed, so that the line forms a continuous loop past the substation, but either of the two groups can be opened for sectionalizing independently of the other. Normal spacing for 44 kv. is readily attained with this construction, which is looked upon as extremely economical as to both wood and steel and requires comparatively few insulators and fittings.



Double right-angled turns achieved with six insulators per circuit and substation taps made off V-connections, keeping main line intact

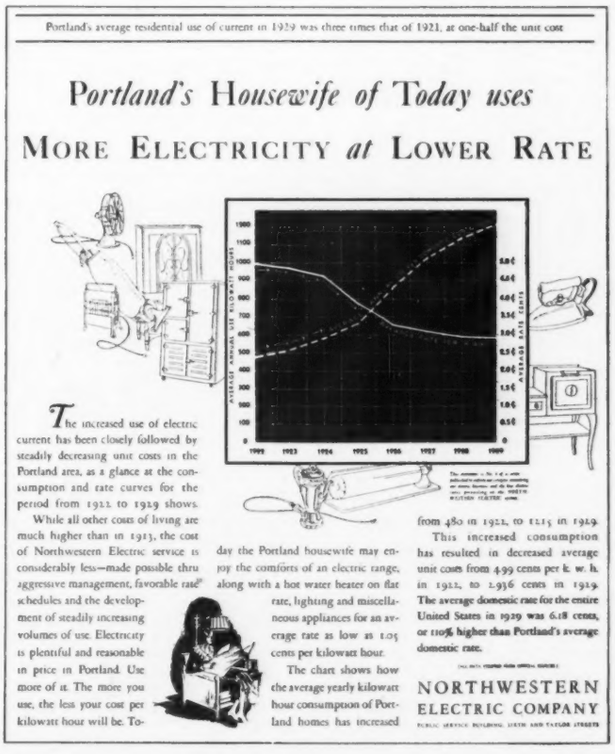
Oregon Amendment Focuses Attention

WHEN, on November 4 last, the people of Oregon passed a constitutional amendment, reprinted herewith, providing for the formation of public utility districts, they enacted legislation that has perplexed leaders of the electrical industry elsewhere in the country far more than they disturbed those familiar with the local situation. After sufficient time had elapsed for the political atmosphere to clear, ELECTRICAL WORLD sent a representative to Oregon to determine as accurately as possible the psychology of the public mind that resulted in passage of the so-called Grange bill. Leaders both within and outside the industry were interviewed, as well as wage earners in ordinary walks of life. The results were quite interesting.

Utility leaders are observant, naturally, but they see no cause for uneasiness. Franklin T. Griffith, president Portland General Electric Company, and Guy W. Talbot, president Pacific Power & Light and Northwestern Electric companies, both stated that they plan no change in their past program of developing power in advance of needs and rendering the best possible service at the lowest possible rates. Mr. Griffith said that reports of the Federal Trade Commission investigation, with its attendant nationwide advertising in the sensational press, probably shifted enough normal votes to account for the narrow margin for the amendment. He feels that one of the industry's most important problems is to make the public understand the benefits it receives from the holding company. "All companies will have to intensify their public relations programs," said Guy W. Talbot. "They must dig down deeper and find the real sore spots in the public mind."

Of a number of factors that entered into the situation, it is impossible to rank them in order of importance. There seems to be little doubt, however, that the one-sided publicity given to the Federal Trade Commission investigation laid the background upon which local issues were reflected. The vote of 117,776 for the amendment and 84,778 against does not mean that all those who voted for the measure favor public ownership. Conversations with a number of people would indicate quite the contrary. The majority of these people seem to feel that state regulation should be supplemented by a "big stick" that, in case of need—but only in case of need—might be used. Many voters felt that the Grange bill provided that means. Unrest created by the present business depression and the tendency to make a change, no matter of what nature, played a highly important part. Many utility men feel that had it been a normal year the amendment would have been beaten decisively. Active campaigning by Governor-elect Julius Meier, centering largely around the power issue, swung many votes. Numerous ballots were marked only for Meier and the power bill. Municipal ownership sentiment in Portland, by many times the largest city in the state, was fanned by two local newspapers, and this, again, finding fertile soil among the voters, particularly the unemployed, is responsible for Multnomah County's large vote in favor of the amendment.

Power rates in Portland have been an issue for some time, but actually very few places in the country have lower rates. Sentiment in Portland was further reflected in the vote for Ralph Clyde, a municipal ownership advocate, who was elected to the City Commission, by the largest majority given any successful candidate. Two years ago a proposed merger of the two Portland power companies in the interest of economy


Portland's average residential use of current in 1929 was three times that of 1921, at one-half the unit cost

Portland's Housewife of Today uses

MORE ELECTRICITY *at* LOWER RATE

The increased use of electric current has been closely followed by steadily decreasing unit costs in the Portland area, as a glance at the consumption and rate curves for the period from 1922 to 1929 shows.

While all other costs of living are much higher than in 1913, the cost of Northwestern Electric service is considerably less—made possible thru aggressive management, favorable rate schedules and the development of steadily increasing volumes of use. Electricity is plentiful and reasonable in price in Portland. Use more of it. The more you use, the less your cost per kilowatt hour will be. Today the Portland housewife may enjoy the comforts of an electric range, along with a hot water heater on flat rate, lighting and miscellaneous appliances for an average rate as low as 1.05 cents per kilowatt hour.

The chart shows how the average yearly kilowatt hour consumption of Portland homes has increased from 480 in 1922, to 1215 in 1929.

This increased consumption has resulted in decreased average unit costs from 4.99 cents per k. w. h. in 1922, to 2.936 cents in 1929. **The average domestic rate for the entire United States in 1929 was 6.18 cents, or 110% higher than Portland's average domestic rate.**

NORTHWESTERN ELECTRIC COMPANY

PUBLIC SERVICE BUILDING, SIXTH AND TAYLOR STREETS

Electricity is cheap, was the theme of this full-page newspaper advertising series

Oregon's Water Power Utility Districts Constitutional Amendment

That Article XI of the Constitution of the State of Oregon be, and the same hereby is, amended by the addition of the following section, to be known as Section 12:

Section 12.—People's utility districts may be *created of territory, contiguous or otherwise, within one or more counties,* and may consist of an incorporated municipality, or municipalities, with or without unincorporated territory, for the purpose of supplying water for domestic and municipal purposes; for the development of water power and/or electric energy; and for the distribution, disposal and sale of water, water power and electric energy. Such districts shall be managed by boards of directors, consisting of five members, who shall be residents of such districts. Such districts shall have power:

(a) To call and hold elections within their respective districts;

(b) *To levy taxes upon the taxable property of such districts;*

(c) *To issue, sell and assume evidences of indebtedness;*

(d) To enter into contracts;

(e) To exercise the power of eminent domain;

(f) To acquire and hold real and other property necessary or incident to the business of such districts;

(g) To acquire, develop and/or otherwise provide for a supply of water, water power and electric energy.

Such districts may sell, distribute and/or otherwise dispose of water, water power and electric energy within or without the territory of such districts.

The legislative assembly shall and the people may provide any legislation that may be necessary, in addition to existing laws, to carry out the provisions of this section.

and lower rates was voted down through prejudice and lack of understanding. Many of those who voted against the merger probably likewise voted against the power companies in the November 4 election.

It was the active campaigning against this merger that was largely responsible for the prominence gained by George Joseph, who later was nominated for Governor on the Republican ticket. Subsequently he died and was succeeded by Julius Meier on an independent ticket, opposing Philip Metchen, Republican. Joseph, champion of the people's rights, apparently had gained great popularity, which later swung to Meier.

Another factor was the unintentional, untimely action by the Federal Power Commission on pending applications for power development on two Oregon streams. The utilities involved were required to file complete development plans last August and these received wide newspaper publicity throughout the state. From this, agitators tried to give the public the impression that the power companies were grabbing while the "getting" was good.

All of these things were elements that influenced voters. No doubt, too, the fact that all of the large utilities of the state are controlled by holding companies which are part of the bugaboo "power trust" had something to do with the public's attitude toward the power companies. Then, again, there was an unsatisfactory street car situation in Portland which furnished its quota of those who always vote for a change when times are bad. Failing for years to earn a proper return on the railway end of its combined property, the Pacific Northwest Public Service Company secured a 10-cent fare early in 1930. General resentment over the 10-cent fare must have been reflected to some extent against the company in the vote on the power issue.

It was an interesting thing that, in talking with wage earners, or the man in the street, as it were, the whole thing sifted down quickly to the belief that the power companies were charging the people high rates for "free" water power. As a matter of fact, Portland and Oregon generally enjoy very low rates for all classes of service, yet the constant repetition by agitators of the bald statement that charges are too high eventually makes an impression, even when unsupported by facts. The public everywhere seems to be in need of real information on the cost of developing water power.

Since wage earners in ordinary walks of life constitute perhaps 85 per cent of the voters, it would seem that too much effort has been put forth to educate the other 15 per cent and not enough on the 85 per cent. The 15 per cent are probably reasonably well informed already, but no simple, direct, self-interest appeal has been found that will convince the other 85 per cent during a short campaign. Continuous, never-ending education is needed here. This point was emphasized by C. C. Chapman, editor and publisher of the Oregon *Voter*. Chapman is an able student of political economy and his opinions are highly respected. He is conservative and does not favor government ownership. When asked why, in his opinion, the power bill passed, he said:

> **Your consumers have not been sold on the value of your service. They do not understand your rates or the method of figuring bills. The utilities must further contact the public. Their story should be simple and direct, and must appeal to the self-interest of each and every consumer. Utility executives stand high, but the people will not accept bald assertions about the light and power business without proof. It is necessary to document statements if they are to carry weight.**

Efforts to defeat the measure were confined largely to newspaper advertising, although billboards, the radio and booklets were also used. The two Portland companies alternated weekly with a series of full-page newspaper ads. One series consisted of statements over the signatures of prominent business men telling how low power rates had benefited their particular plant and setting forth their opposition to government in business. This was known as the "Horse-Sense Series." The other company used a series designed to drive home the fact that electricity is cheap in Portland. Billboards were used, but some utility men feel that these created the impression that the power companies were the ones mainly concerned and were spending large sums of money.

The Gubernatorial issue was one of the most hotly contested in Oregon's history and the radio was used extensively for speeches and debates. Since the power question was an important plank in the platform of the successful candidate, this naturally was given great prominence over the air. The greatest use of the radio was made by advocates, while the bulk of the newspaper advertising was done by opponents of the measure. The

radio is recognized as one of the best mediums of reaching the public and there may be food for thought here.

How effective all this advertising and publicity proved is difficult to say. Some peculiar things happened. In some sections, where no effort was put forth by the opponents, the bill was defeated the worst, and in others where there was considerable activity it passed by a good majority. This raises the obvious question, was too much attention focused on the issue and was it made too controversial? Another thing that at first seems strange, but which upon analysis is normal, is the fact that the city of Eugene, having its own municipal plant, which is claimed to be highly successful, voted a good majority against the power bill. Either municipal ownership is not so highly regarded where it is best known or else the people were afraid of being drawn into a power district and having to relinquish their property or bear double taxation in the form of assessments. The town of Hood River, where municipal ownership agitation is rife, also voted against the bill. Klamath County, where there has been a great deal of litigation over water rights and some feeling against the power company, likewise voted against the measure, apparently because the people were desirous of having the private utility go ahead with a proposed hydro development to create an additional industrial power supply and more taxable property.

What will be the outcome?

Since the amendment actually passed, the most important question is, what will happen? First, the Oregon Legislature after convening on January 12, 1931, must set up the necessary machinery for carrying out the intent of the enabling act. It is believed that legislation will be patterned largely after the district power bill, which passed in Washington on November 4 also. This provides for creation of public utility districts by popular vote. These districts have power to issue bonds and do all things necessary to develop, distribute and sell power, including the right to condemn the property of existing utilities. A bitter fight is expected in the Oregon Legislature over the exact nature of the bill, but, in any event, the Legislature is duty bound to pass some kind of a bill at this session. No matter what the nature of the act, it is entirely possible that the referendum will be invoked and the specific act of the Legislature put to a vote of the people.

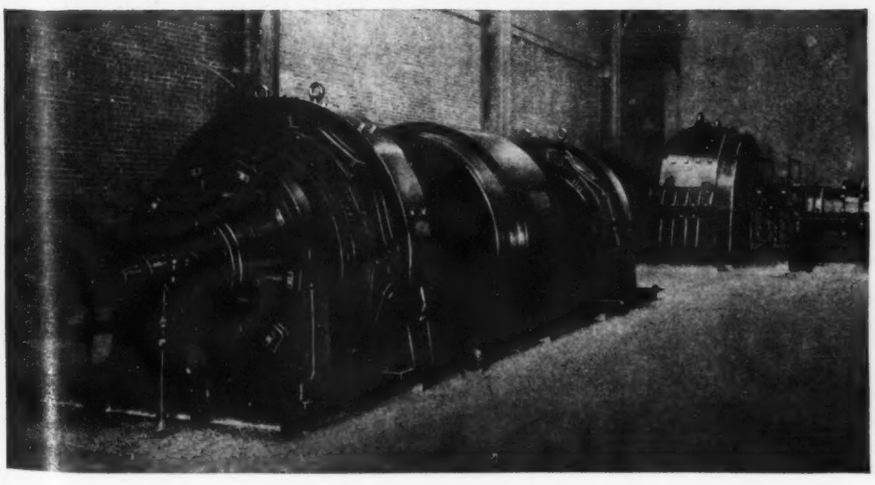
It seems unlikely that any utility districts will be created, although several cities already have tentative plans. The city of Portland has filed on the Bonneville site on the Columbia River, where it is thought that 500,000 hp. can be developed. The city of The Dalles has filed on Celilo Falls on the Columbia, where there is said to be 750,000 hp. available. Both cities also have filed on several sites on the Deschutes River. Portland would develop 212,000 hp. at five different sites at a cost of $18,000,000 and The Dalles would develop 85,000 hp. Water-power development in Oregon is all tied up with the Umatilla Rapids project on the Columbia River, where about 750,000 hp. is available. Federal aid is being sought for this combination irrigation and power project and it appears that there may be considerable conflict between backers of this project and advocates of some of the more ambitious schemes lower down on the river. When it comes to actual authorization of the necessary huge bond issues it is believed that these grandiose schemes will come to an abrupt halt. Permissive legislation is one thing, but the raising of vast sums of money is quite another.

One thing is certain to happen in Oregon. Passage of this amendment has opened up a fertile field for a profitable "racket" for idle enginers. Ambitious engineers will try to make jobs for themselves by "selling" all sorts of foolish schemes to the public. Out of this should come some badly needed education.

Utility men expressed little concern over passage of the power bill in Oregon. California has had somewhat similar legislation on its statute books since 1921, and only two purely water districts have been formed—the East Bay Municipal Utility District and the Metropolitan Water District. In any event, each move to create a power district in Oregon will require a vote in the territory included and will constitute a local issue, upon which local taxpayers opposed to large bond issues can concentrate. In the meantime all utilities will proceed with unshaken confidence with their programs of developing power in advance of needs, building up the business and rendering the best possible service at the lowest possible rates.

▼ ▼ ▼

Synchronous Motor-Generator Feeds 4,000-Hp. Reversing Mill



No flywheel is used on the motor-generator set feeding the 4,000-hp. reversing mill in the A. M. Byers wrought-iron plant at Economy, Pa. The set is driven by a 5,000-hp., 6,600-volt synchronous motor coupled to two 2,200-kw., 514 r.p.m., 900-volt generators. The peak-loads are passed back into the line.

Courtesy General Electric Company

Precious-Metal Worker Uses Ten Electric Furnaces

UNTIL the recent developments in the use of electricity for metallurgical processes the heat treatment of precious metals and alloys was largely confined to fuel-burning furnaces. These older methods had the objectionable features of burning and oxidizing the products, resulting in variable physical and chemical properties and causing considerable shrinkage, which in some cases meant a loss of more than 2 per cent of the original material. The fuel-fired furnaces in certain cases made it impracticable to treat special alloys having critical temperatures for melting or annealing which required the close control that can only be obtained with automatic electric heat. These difficulties have been overcome by the use of electric heat treatment.

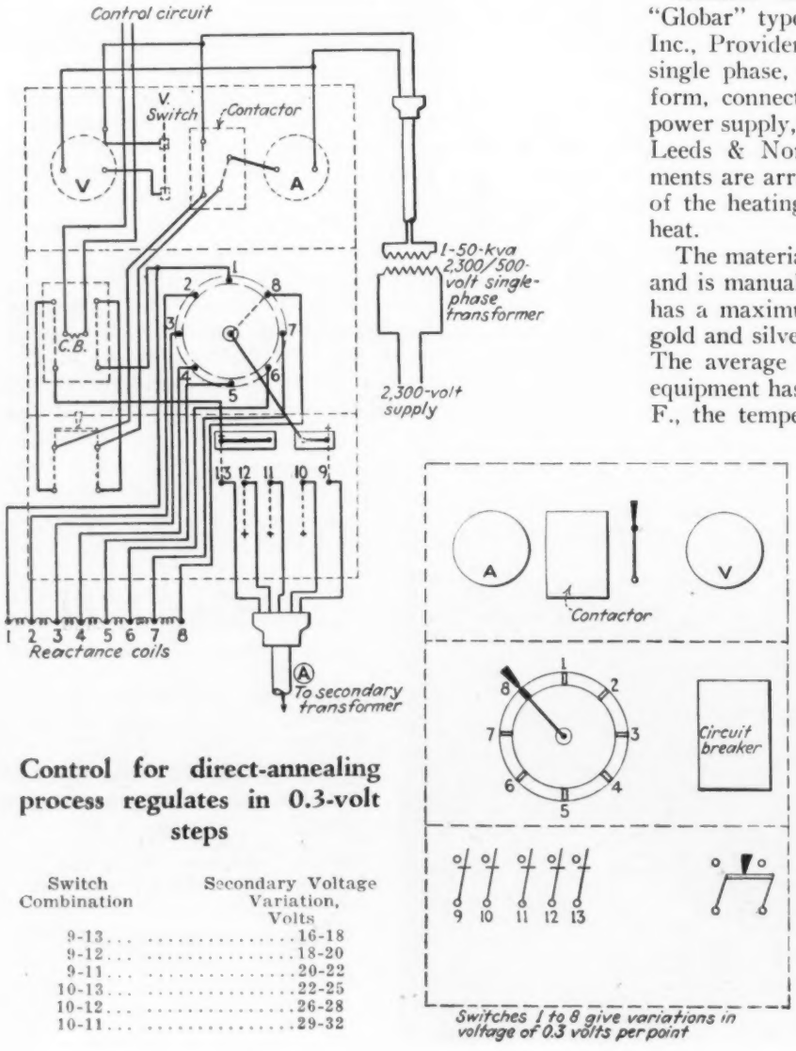
The use of electric heat in the various processes connected with the manufacture and heat treatment of platinum, gold and silver alloys and of gold and silver solders involves some interesting applications at the plant of the D. E. Makepeace Company, Attleboro, Mass., which employs ten electric furnaces in its operations for melting, annealing and tool hardening.

Electric melting in this plant is performed in a "Globar" type furnace made by C. I. Hayes Company, Inc., Providence, R. I., and rated at 22 kw., 110 volts, single phase, 60 cycles. The heating elements are bar form, connected through water-cooled terminals to the power supply, the heat being automatically controlled by a Leeds & Northrop temperature regulator. Eight elements are arranged in pairs on the top, bottom and sides of the heating chamber, to give an even distribution of heat.

The material to be melted is placed in a carbon crucible and is manually stirred by a carbon stick. This furnace has a maximum capacity of melting 300 oz. of alloyed gold and silver per run and a minimum capacity of 5 oz. The average time per melt is about 25 minutes. The equipment has a temperature range of 1,000 to 2,500 deg. F., the temperature dropping at the beginning of each melt and building up to full value in about five minutes. The average daily energy consumption is about 130 kw.-hr. for a nine-hour day. Assuming eighteen average melts per day, the average consumption of energy is about 1 kw.-hr. per 41 oz. of alloy.

The cost of electric melting is made up of power, at the average rate of 2 cents per kilowatt-hour; water for cooling the terminals, at the rate of about 5,000 cu.ft. per month (the bill amounting to $9.50); monthly replacements of heating elements, $47.60 per set of eight; monthly replacement of terminal tips, $25 to $30; general repairs and maintenance of furnace, at an average monthly expense of $10. With an assumed average power bill of $62, the monthly cost of the electric melting is approximately $154.

There are seven Hayes electric annealing furnaces in the plant, one of the



Control for direct-annealing process regulates in 0.3-volt steps

Switch Combination	Secondary Voltage Variation, Volts
9-13	16-18
9-12	18-20
9-11	20-22
10-13	22-25
10-12	26-28
10-11	29-32

"muffle" type and the rest of "arch" construction. In the muffle furnace the heating elements are in the form of wires placed outside around the heating box, while in the arch type the heating coils are supported on a number of heat-resisting arches over the combustion space. There are also two tool-hardening furnaces used for taking care of tools in the plant. The annealing furnaces have a combined rating of 259 kw.

The annealing furnaces are controlled by varying the supply voltage through a number of reactance coils, which in the arch type furnaces consist of one separate reactance for each set of three arches. Each set of arches is controlled automatically by the Hoskins type of temperature regulator. The temperature range for the annealing furnaces is from 1,000 to 1,400 deg. F.

The rate of production typical of a 32-kw. furnace having inside dimensions of 8x24x48 in. with nine arches is about twenty annealings per day, with a maximum capacity of 600 oz. per charge, taking from fifteen to 30 minutes per batch, depending on the material.

The main advantages of the electrically heated over the fuel-fired annealing furnaces are the freedom from oxidation and from sulphides on the surface of the silver alloys.

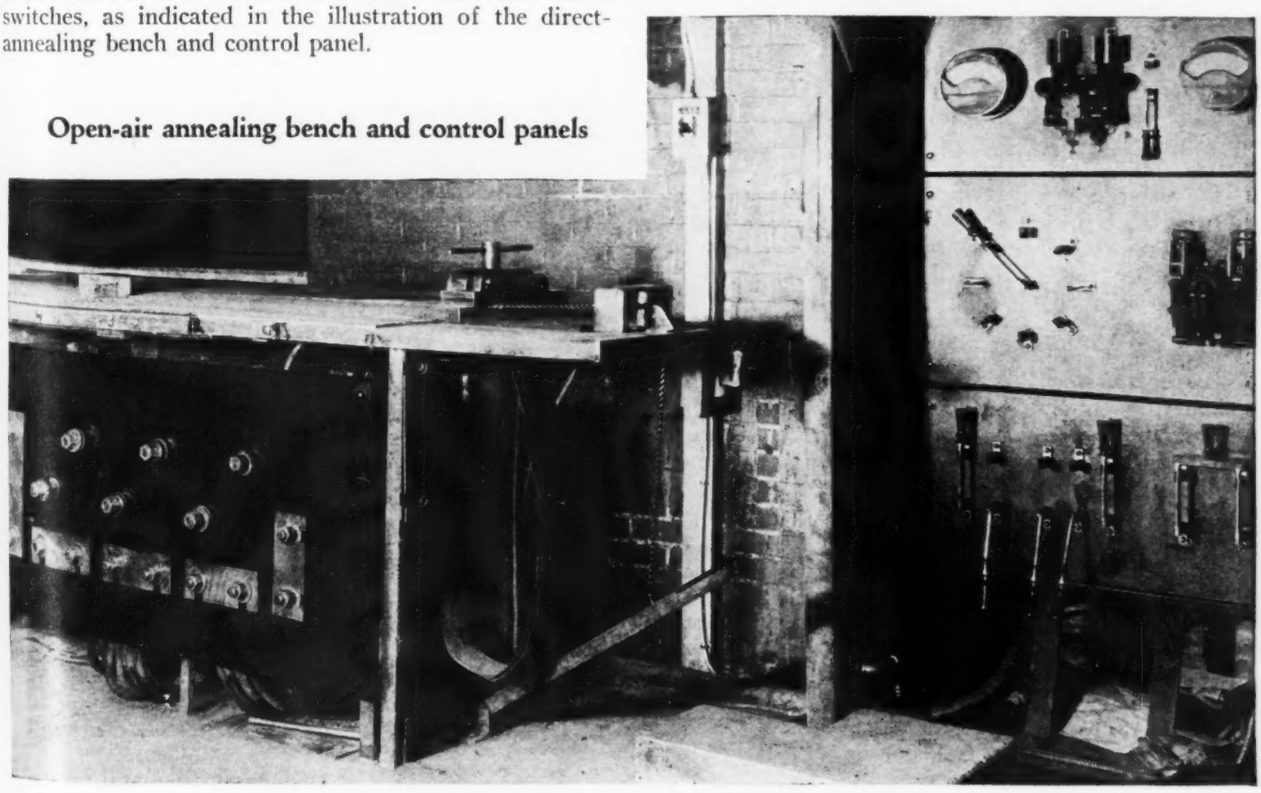
Direct annealing cuts labor cost 98 per cent

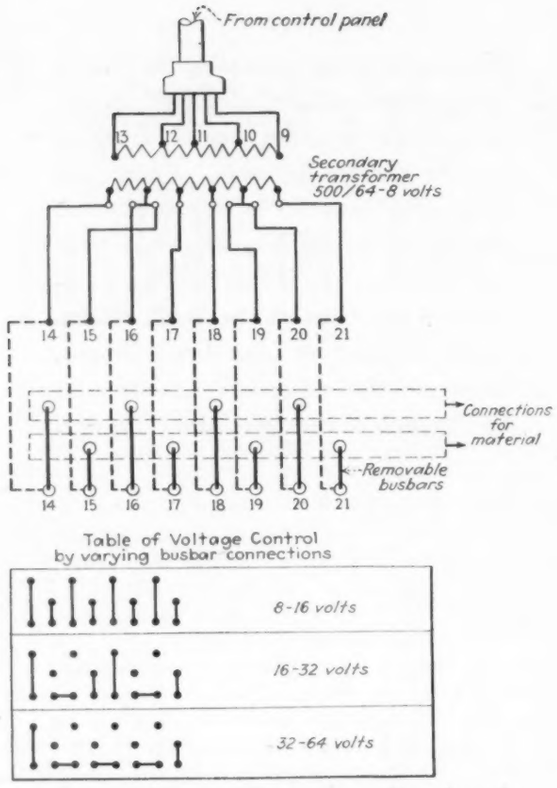
There is an interesting application of electric heat in the direct-annealing process, where the current is made to pass directly through the material to be treated. The power for this process is taken from a separate single-phase, 500-volt feeder which is stepped down through a special transformer and a number of secondary taps to voltages vaarying between 8 and 64, according to the connections used in the secondary circuit. The control of the secondary voltage is made by means of a set of removable busbars in combination with two sets of knife switches, as indicated in the illustration of the direct-annealing bench and control panel.

Electric melting, annealing and hardening furnaces are winning notable success in precious metal treating for the jewelry industry. Direct annealing of material in transit in open air also shows superior efficiency over old methods. In this article the modernized practices of the D. E. Makepeace factory at Attleboro, Mass., illustrate the value of electricity in this branch of commercial metallurgy.

The detail of wiring of the control panel for the direct-annealing process is indicated in the schematic wiring diagram, showing the power supply from the 50-kva., single-phase transformer, where the voltage is stepped down from 2,300 to 500; the main connections at the rear of the panel; the taps to seven reactance coils for varying the voltage by means of the eight-point switch, and the connections between the five single-pole knife switches and the five taps on the secondary transformer where the voltage between the terminals of the material to be treated is reduced to 64-8 volts, depending on the secondary connections. The method of varying the working voltage at the panel is indicated in the front elevation of the wiring scheme of the board, showing the eight combinations possible by the operation of the eight-point switch giving a variation of 0.3 of 1 volt for each point

Open-air annealing bench and control panels




From control panel
13 12 11 10 9
Secondary transformer 500/64-8 volts
14 15 16 17 18 19 20 21
Connections for material
Removable busbars
14 15 16 17 18 19 20 21
Table of Voltage Control by varying busbar connections
8-16 volts
16-32 volts
32-64 volts

Connections at direct-annealing bench

on the switch; also six additional combinations by the use of the single-pole knife switches.

The details of wiring at the annealing bench show the five connections between the panel and the secondary transformer and the eight taps from the secondary coils of this transformer and the studs of the removable busbars. These variable busbar connections permit a still further regulation in working voltage, as indicated in the table attached to the diagram of connections at the annealing bench.

The average current in the secondary circuit consumed by the material in process is 600 to 700 amp., producing a temperature of 1,000 to 1,300 deg. F. The material treated by direct annealing is usually in the form of a metal ribbon varying from 0.006x1.0 in. minimum to 0.125x4.0 in. maximum, having an average length of 25 ft. The average time for this process is from 2½ to three minutes, including handling. This method of annealing in the open has the advantage of eliminating a special furnace; a saving in man-power, which is indicated in the comparison of two men for three minutes, as against ten men for 30 minutes, with the added advantage of obtaining a definite product of better quality. The direct-annealing process, with a first cost of $4,000, paid for itself in nine months.

There are 25 motors in the plant aggregating 337 hp., besides the usual lighting service.

The distribution system picks up the incoming energy at 2,300 volts, three phase, 60 cycles. Part of this is stepped down to single phase, 500 volts for the direct-annealing circuit; the rest of the power is either three-phase, 240 volts for the motor circuits or 240/120 volts, single phase for heating and lighting. The single-phase circuits are balanced at the distributing and meter boxes so that the secondary loads in the distributing transformers are divided evenly between the three phases. On account of the fairly large inductive load of the induction type motors used throughout the plant, the new motor on the "breakdown" mill is of the synchronous type. This will be used about 20 per cent of the time as a motor carrying the load of the mill, and will act as a synchronous condenser for power-factor correction on a full 48-hour basis per week.

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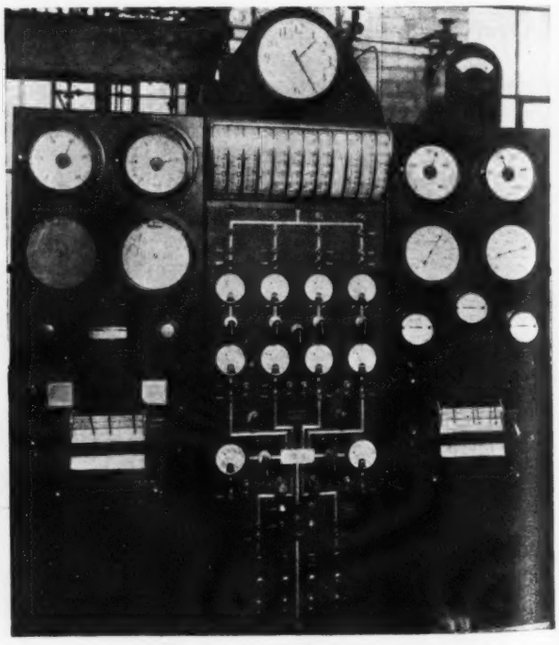
Precision Control of Fuel Combustion

The concentration of instrument and control equipment in the new steam-generating plant of the Champion Coated Paper Company at Hamilton, Ohio, is an interesting example of a trend that started in the utility field and is now spreading to the industrial field. The three panels illustrated control a 2,750-hp. B. & W. boiler equipped with four Riley coal pulverizing and feeder units. The "bus" layout on the central panel indicates the fuel flow through the pulverizers and feeders into the furnace, the flow of feedwater into the boiler and the position of the emergency switch governing the steam control valve in the boiler delivery line. Inputs to each pulverizer motor, forced- and induced-draft fan and speed of each feeder table are shown on meters. Pilot lamps indicate live circuits, speed limits of feeder tables, whether the feedwater alarm is operating or silent and other information. The outer panels carry instruments indicating and recording temperature, pressure and flow data. Electricity plays a vital part in the massing of these instrumental and control resources at this "mechanical switchboard."



Panel shows flow of fuel, feedwater and steam

Why Not Use More of Our Own Goods?*

By SARAH HARDING HUNTER

Promotion Department,
Edison Electric Illuminating Company of Boston

Why are so many appliances missing from the homes of workers in the electrical industry? Miss Hunter's analysis of a recent Boston Edison survey shows that among the groups of people studied first cost is not the controlling reason except in a few cases. Inertia and lack of vision seem to be major factors as one looks into the mirror of this inquiry. These things can be remedied and must be, if the modern home is to be electrified on a scale commensurate with present-day resources

SITTING at his desk, the electrical merchandising manager of today studies the consumer market; he analyzes figures and curves based on market surveys and eagerly reads all material that may help him to solve the problem of understanding his public, but up to the present time little attention has been given to the consumer market of the people within the electrical industry.

This market deserves a shrewd analysis, for it will help us to develop a finer appreciation and understanding of our consuming public. We are beginning to realize more and more that our ideas on electric service are not so different from those of our public after all. The more we willingly and frankly analyze our own homes, finding reasons for and against the use of electrical equipment, the closer we shall come to solving the problem of reaching our public.

Last summer a survey was made of existing conditions within the industry to compare it with the public consumer market. The figures, some satisfying and some alarming, furnish us with material upon which to base logical conclusions that should be to our advantage.

Even among ourselves we have a fertile market for electrical merchandise. The percentage data of Table I show how many of us are still without some of the major appliances; in other words, the figures point out opportunities for us to sell to ourselves as well as to our public. As we study these figures, do we feel encouraged because the outside public compares favorably with ourselves in appliances missing from our homes?

Usually in making surveys among small groups I find that there are more radios than refrigerators, but I am very happy to retract that statement for this group of people. During the past year 32 radios were bought and 33 refrigerators. So, perhaps, if we keep up this reverse purchasing radio standard, the final number of refrigerators within the next few decades may outnumber the total radios.

Sixty-six per cent of the vacuum cleaners owned by this group were used only two or three times a week. It is difficult to understand why the vacuum cleaner is not used daily. Even some of the women engaged in our industry have informed me in earnest tones that it is harmful to the life of the rug to use a cleaner over it daily. Some feel that the crumbs around the dining-room table don't demand the use of the cleaner, but crumbs embedded in the nap of any rug are more harmful than a host of vacuum cleaners. Many people are still clinging to the idea that the carpet sweeper should be used as an auxiliary cleaner. The vacuum cleaner should not only represent a market for electrical merchandising, but it can represent a market for increasing kilowatt consumption. Home service people can do much in teaching the home makers the true value of this appliance. I would like to sound the praises of the home service group in this survey, for the figures showed that they were most conscientiously trying to live the doctrines they preach.

Some merchandising authorities believe that the price of a thing is not the determining factor that keeps the public from purchasing electrical equipments. Although some may argue that these figures do not reflect the real conditions, it is interesting to see how we think, and how the public thinks, about our electrical equipment.

If money is not the real cause (Table II) for a fair percentage of the public to procrastinate in purchasing, then there is some undiscovered reason or some appeal that we have been at a loss to make. As in the past, it is still our problem to create an unsatisfied desire in people to own electrical appliances so that they will purchase them to use to their own advantage. I have unhesitatingly agreed with many home-makers who have told me that they do not consider the cost of any piece

**Based upon an address before the New England Division, N.E.L.A.*

of equipment justified unless it is a means to a greater end. This may sound too abstract at first, but I have yet to be balked in interpreting to our home makers "the means to a greater end" in the purchase of any major appliance. A household scientist outside of our industry, Florence Scherz, has expressed this completely in saying: "We want more homes to use just as much more power as they can afford to use, and we want them to use it for a definite purpose in order that the family may have more time, strength, health and nerve force for better things in life than household tasks."

To me the electric range brings a mental picture of the mother placing a complete dinner in the oven, setting the automatic time clock and going out into the sunshine to be in companionship with her children. It is all too true that the majority of boys who find themselves in reform schools are the boys whose mothers never had time to play with them. It is quite possible to awaken mothers to the necessity of educating and training their children in the early years as well as to sacrifice diligently for the future college education.

It is my personal viewpoint that every problem entering the home is influenced by both home makers, the man and the woman, and that the man enters into the picture of selecting and purchasing electrical equipment. This is shown by Table III.

Criticisms of customers have been made because of their unbalanced sense of values concerning the things in the home. So Table IV is a comparison that voices our own opinions on the relative importance of the listed articles in our own homes and in those of the public.

These figures have given me a more wholesome respect for our home makers. They are looking at their problems in life—problems on home making—in a sane and practical way.

The question was asked in the survey if the purchase of any appliance had been postponed because it was still considered in the experimental stages. Every age has been handicapped by "Old Man Suspicion" even to the present day. In the early days, when kerosene lamps were heralding a new day, the trusty candle was ready for the expected emergency, and then when gas lights were introduced the kerosene lamps kept diligent vigil. When electric lights were introduced, we felt it necessary to combine gas and electric lights on the chandeliers, and so it is perhaps not too embarrassing to note that 56 power people postponed purchasing appliances because they felt that the particular piece of equipment was still in the experimental stage. The appliances that appear on this "suspicion list" include sun lamps, water heaters, ranges, oil burners, radios, refrigerators, exercisers, aërators, washers, humidifiers, ironers and dishwashers!

The final survey question included the number of rooms in the house, whether the house had been rewired within the last five years and how many rooms had two or more baseboard outlets. Using as a standard for

Nature of Groups Analyzed

Group "A" includes 60 people in light and power companies. This group represents a composite picture of the people engaged in this branch of the industry, for the survey was answered in equal numbers by executives, male and female office employees, salesmen and home service workers.

Group "B" represents 60 executives and representative employees from member contractors, dealers and manufacturers.

Group "C" includes 60 home makers from many organizations before whom the author lectured during the past year.

Table I—Percentage of Group Without Named Appliances

	60 Persons in Power Industry "A"	60 Persons in Contractor-Mfr. Group "B"	60 Home Makers "C"
Range	53	91	90
Refrigerator	40	55	88
Vacuum cleaner	12	12	15
Hand cleaner	100	98	98
Washer	40	55	48
Ironer	83	88	97
Dish washer	97	100	98
Kitchen aid	98	98	100
Water heater	90	100	100
Sun lamp	95	95	95

Table II—Number of Persons Deferring Purchase of Named Appliances on Account of Initial Cost

	60 Persons in Power Industry "A"	60 Persons in Contractor-Mfr. Group "B"	60 Home Makers "C"
Dish washer	1	2	0
Ironer	7	4	8
Kitchen aid	1	2	0
Radio	3	1	5
Range	10	16	6
Refrigerator	18	23	33
Washing machine	1	7	10
Water heater	13	4	0
Vacuum cleaner	0	3	4
Sun lamp	0	1	0
Miscellaneous	8	8	3
Total	62	71	69

Table III—Deciding Voice in Selection of Household Electrical Equipment

	Percentages of Group		
	60 Persons in Power Industry "A"	60 Persons in Contractor-Mfr. Group "B"	60 Home Makers "C"
Mr. and Mrs. Householder	30	30	48
Mr. Householder	30	35	17
Mrs. or Miss Householder	40	35	33

Table IV—Opinions as to Relative Importance of Articles

	Order of Importance		
	60 Persons in Power Industry "A"	60 Persons in Contractor-Mfr. Group "B"	60 Home Makers "C"
Automobile	3	1	3
Piano	7	7	6
Radio	6	5	5
Range	4	6	4
Refrigerator	1	2	2
Vacuum cleaner	2	3	1
Washer	5	4	3

Table V—Extent to Which Industry Groups Are "Wiring Conscious"

Minimum standard of "good wiring," two outlets per room. 310 persons replied.

	—Percentage of Awareness— Power Industry Group	Contractor-Mfr. Group
Unaware of poor wiring	43	43
Aware of poor wiring	39	32
Aware of good wiring	15	22
Vision of meeting future need through improved wiring	3	2

adequate wiring only two baseboard outlets per room, I found many saying that their home was adequately wired for present and future with only one or two. Some possessed no room with two outlets.

The figures of Table V clearly indicate the need for educational programs among the employees of the electrical industry. Little can be said for the first group who have poor wiring and are blissfully ignorant. One redeeming feature is that many have poor wiring and know it. Some have adequate wiring and realize it. A few have adequate wiring but realize there is to be a future need for electric service.

Until we can find a practical solution to our own problem I do not understand how we can expect to reach our home-maker public.

As yet there is not the realization of adequacy; there is only a small opening toward the vista of our future needs and uses for electric service not only in the homes of our consumer public, but in the homes of our industry.

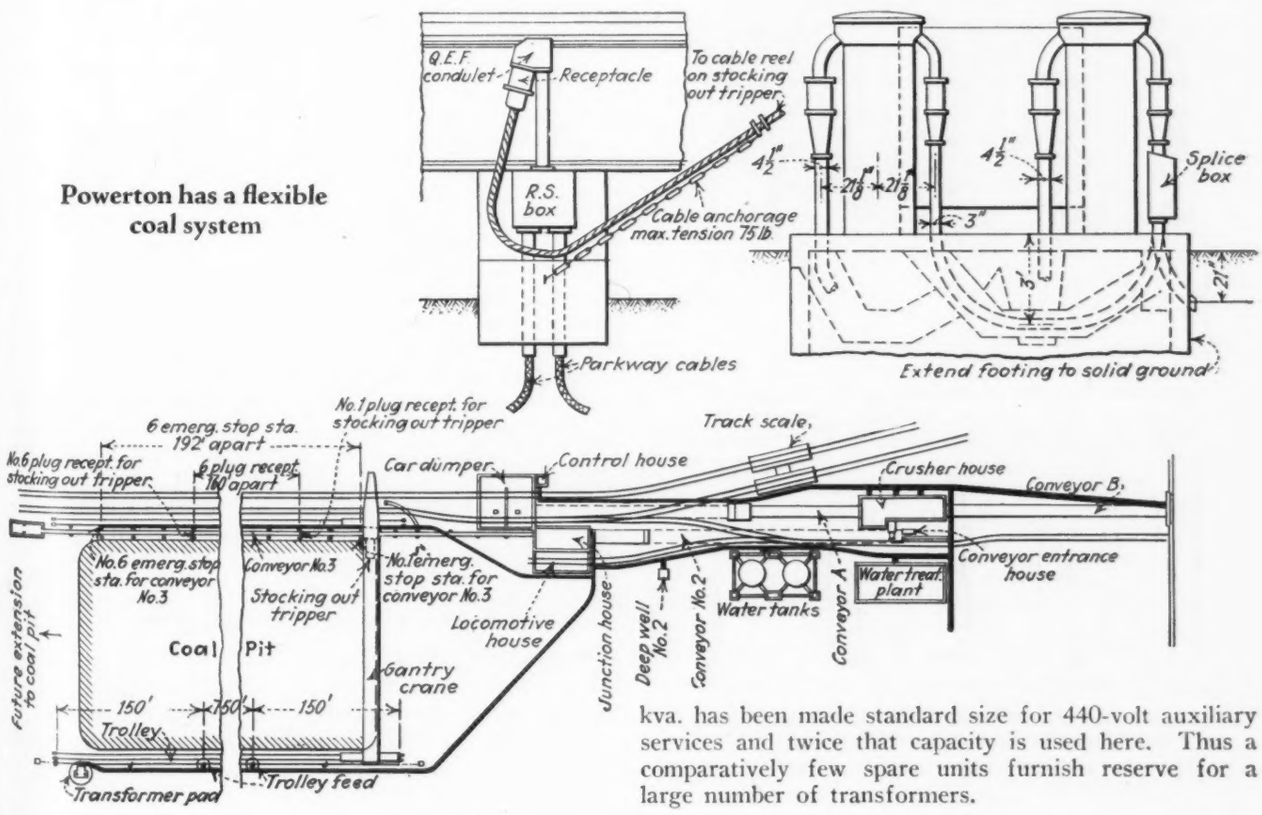
Coal Handling at Powerton

A feature of the coal-storage arrangement at the Powerton station of the Super-Power Company of Illinois is the use of a "stocking-out tripper" for handling the fuel into storage. The pit is paralleled along one side by a conveyor over whose length the tripper runs and from which it removes the coal. The coal is taken by a gantry crane from the discharge of the tripper and deposited in the storage pit, which is about 1,000 ft. long and a quarter as wide. The crane brings coal from storage and through a reclaiming hopper on the crane leg deposits it on the conveyor, now running in the other direction. The tripper has no trolley; it is fed from any one of six plug receptacles spaced 160 ft. apart along the track. On the tripper car is a take-up reel with about 100 ft. of cable, which is plugged into the receptacles. The inset detail shows the cable receptacle with its anchor chain to prevent strain on the connection as the tripper moves.

All of the power and control lines in the yard are underground, but not in conduit. Parkway cable is used. A detail of the illustration shows how the cable is brought up to outlets through a concrete block in which the conduits from the boxes are held. Creosoted planks are laid over the cables.

Feed for the gantry-crane trolley comes from a parallel bank of two auxiliary three-phase transformers set on the pad indicated in the lower left-hand corner. A detail shows how these transformers are mounted on the pad and the manner in which the cables are brought up to the transformer terminals through the pad. The parallel connection of transformers is used because 300 kva. has been made standard size for 440-volt auxiliary services and twice that capacity is used here. Thus a comparatively few spare units furnish reserve for a large number of transformers.

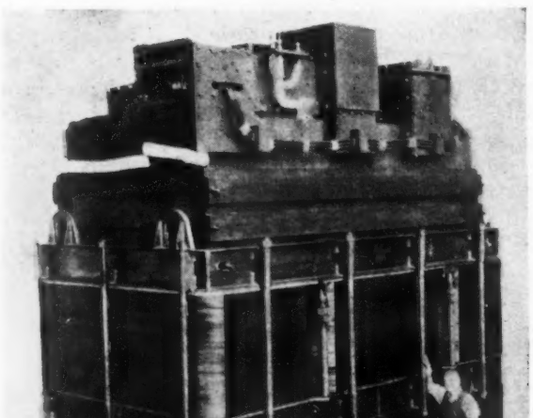
Powerton has a flexible coal system



Design Features of World's Largest T

By H. L. COLE and F. J. VOGEL

Transformer Engineering Department, Westinghouse Electric & Manufacturing Company, East Pittsburgh



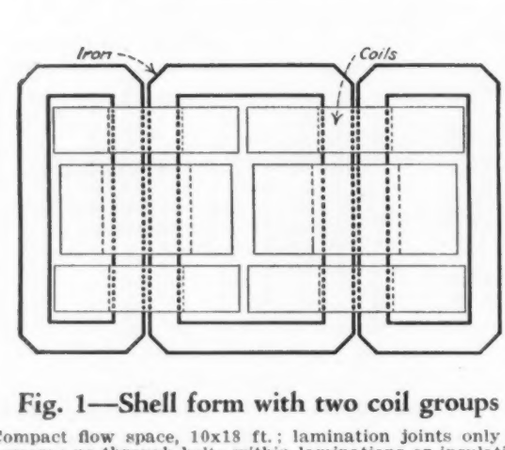


Fig. 1—Shell form with two coil groups

Compact flow space, 10x18 ft.; lamination joints only at corners; no through bolts within laminations or insulating end frame.

THE world's largest power transformers, having greater kva. capacities at the highest transmission voltage in use, and exceeding by far in physical size and weight any transformers previously built, are located at the Roseland, N. J., switching station of the Public Service Electric & Gas Company.

Seven in number, they form two 90,000-kva. transformer banks, with one spare, stepping from 220,000 Y volts to 132,000 Y volts (or vice versa), with a 60,000-kva. 11,000-volt delta-connected tertiary winding for supplying synchronous condensers. The transformers are oil-insulated, self-cooled by radiators, single-phase units for 60-cycle service and the 132,000-volt winding is made up of two separate windings, each of one-half capacity, for connection to a double bus transmission system.

All of the four transformer windings are designed so that with future forced air blast on the radiators capacities 50 per cent greater may be obtained. The single-phase ratings of each transformer are as follows:

Winding	Voltage	Self-Cooled, Kva.	Air-Blast, Kva.
High voltage	220,000 Y	30,000	45,000
Low voltage (1)	132,000 Y	15,000	22,500
Low voltage (2)	132,000 Y	15,000	22,500
Tertiary voltage	11,000	20,000	30,000

The equivalent winding capacity as a two-circuit transformer is 60,000 kva. at the air-blast rating.

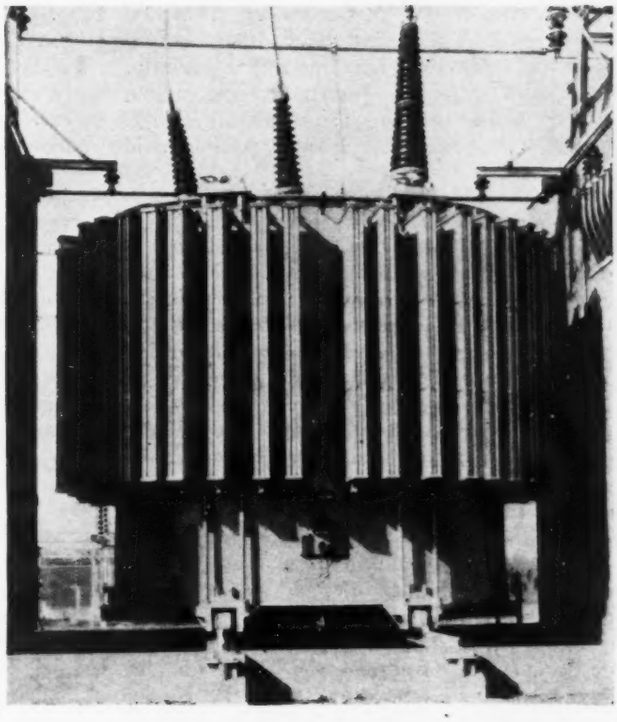
Tap changing under load equipment is anticipated as a future requirement. The capacity of the windings will permit a separate regulating equipment, excited from the tertiary winding, to vary the voltage plus and minus 7½ per cent in the 220,000-volt circuit.

The 132,000-volt windings were insulated similarly to 154,000-volt standards, and were tested accordingly, and the 220,000-volt windings were tested at 570,000 volts, to be in accord with the line insulation used, which was above the usual standards for 220,000-volt service. So far as is known, this is the highest test voltage ever induced in a power transformer.

Shell form most advantageous

Mechanical arrangement of the core and coils is an extension of the well-known shell form of construction and comprises two complete coil groups mounted side by side. Each group of coils is approximately the same length as in a large power transformer having a single coil group, so that the mechanical support of the wind-

Transformers



ings and the ventilation of the core offered no difficult problems.

The weight of the transformer exceeds that of any known transformer in the world and is segregated as follows:

Core and coils, 240,000 lb.; case and fittings, 115,000 lb.; oil, 235,000 lb.; total weight, 590,000 lb. Floor space required is 22½ x 28½ ft.; total height, 35 ft.; height over tank, 23 ft. Local installation requirements necessitated lifting the complete transformer with oil. This was accomplished by means of heavy tie rods extending from a special structural base to lifting shackles attached to the cover. Sixteen broad-flanged steel wheels with roller bearings support the transformer on its foundation. An equal distribution of the weight on each wheel is assured by a design of cradles in which the force on each set of four wheels is carried on the two main axles.

The tank is made in three sections, each of which is 7 ft. high. These tank sections were placed on the side for shipment, each section making a car load 7 ft. wide, 22½ ft. long by 14 ft. high; they are bolted together in the field and a steel strip is welded over the inside joint to assure their being oiltight.

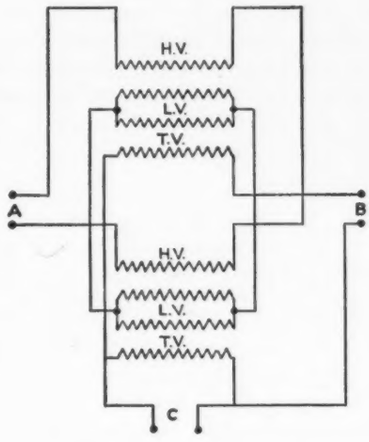


Fig. 2—Loading back test with all windings in circuit

Two sources, *A* and *B*, with proper phase relation, supplied load losses and *C* the excitation. A total machine capacity of 10,000 kva. was required.

Assembly of the coils and insulation offered many problems due to the size, test voltage and consideration of lightning surge conditions within the winding.

As previously noted, the construction used was shell type, with its well-known advantages in bracing and ventilation. Spacers are so placed as to provide a positive support for each conductor, and the cooling ducts, being vertical, provide free ventilation and best cooling effect. This form of construction also provides simple means of grading the insulation to take advantage of the reduced insulation requirements near the grounded end of the winding. This grading was only done in this case on the high-voltage winding, which was divided into four groups, two on each leg, and which were graded according to the maximum voltage to ground in each group. The high-voltage winding was also designed to be grounded through a reactance, with other suitable device to protect the transformer from oscillations due to lightning surges. This reactance is to protect the transformer and system against excessive short-circuit currents in case of line failures, but is not to be installed until a later date.

Tested at over half million volts

The high-voltage winding was tested by inducing 570,000 volts within it with one end grounded. The high test was required due to the high strength of the line insulation, as the insulation was specified to be stronger than eighteen standard 10-in. disks with 5¾-in. spacing. It is to be here noted that inducing such a voltage in the high-voltage winding also induced 309,000 volts in each of the 132,000-volt windings.

In designing this transformer, with the high line insulation required, particular attention was given to the surge voltages likely to be encountered and the distribution of these stresses within the winding. As is well known, the shell form of construction, with relatively wide coils, furnishes a very good distribution of voltage under both sharp steep front surges and long surges, and the design of the various groups was carefully laid out to withstand service conditions.

The low-voltage windings were insulated for the 154,000-volt class (309,000-volt test to ground), due to the established use of this class of insulation on the transmis-

sion system of the Public Service Electric & Gas Company. Size of the design had to be watched particularly to permit shipment, handling and installation. Voltages such as these require great clearances, and it was necessary in laying out the position of all leads to be careful to use the least space and still provide adequate clearances.

Leads create space problem

Particular care in the lead construction was required due to the number of leads required, the test conditions and the service conditions. The voltage existing under the test conditions between all leads and the voltages to be experienced in service both had to be considered. These are not always the same, since two parallel windings may have practically no voltage between them under test, but in service, if connected to separate lines, may be subjected to considerable surge voltages. With the height and space requirements, this was one of the most difficult problems in the design.

The 250,000-volt bushings for the high-voltage winding deserve particular note, as these bushings have undoubtedly the highest dry and wet flashovers of any previously built for outdoor power service, testing at considerably over 700,000 volts. These bushings are condenser type, approximately 18 ft. high and 15¼ in. in diameter outside the micarta of the condenser. They weigh more than a ton each (2,420 lb.).

Advantages of the condenser type of bushing for these voltages are many. Such bushings have small diameter, require little inspection and maintenance, have the ability to operate even with broken rainsheds temporarily, and hence have less liability of fire and damage than other types of bushings in case of such an accident as porcelain breakage.

Relaying from tapped bushings

These bushings are also provided with taps which can be used with a network which will supply a voltage suitable for relay use or for synchronizing. Application of such a device may avoid the use of potential transformers, which are very expensive for such high voltages.

The losses in these huge transformers are remarkably low, even though the insulation requirements are extremely high. The iron loss of 90 kw. and copper loss at 30,000 kva., 220,000/132,000 volts, of 129 kw. give an efficiency of 99.29 per cent at five-sixths load. With all windings fully loaded the copper losses are 175 kw. The temperature test was made with all windings fully loaded, giving the same conditions of heating obtained when the transformers are operated at full load lagging power factor on the secondary, with a zero power factor leading load on the tertiary.

Twin windings limit breaker duty

Concentration of power at this point in the transmission system of the Public Service Electric & Gas Company will be so great that the 132,000-volt circuit is split into "twin windings" in the transformer. At present these two windings will be operated in parallel. In the future two separate low-voltage buses are contemplated, to reduce the possible short-circuit kva. on the system.

The design of transformers with twin windings to permit lower rated breakers has been in successful use for the past ten years on the 11,000-volt side of a 70,000-kva. step-up transformer bank. The Roseland transformers are the first to use the double bus scheme in connection with a 220,000/132,000-volt transmission system and are the first with twin windings and a tertiary winding as well. They are virtually four-winding transformers, as the 132,000-volt windings are entirely separate from each other.

Between the low-voltage windings the reactance is 106.8 per cent at 30,000 kva., a high reactance being desired to limit short circuits on one of these windings. In transformers with twin windings designed for exceptionally high reactance between the windings there is an interdependent relation between the windings which ordinarily will limit the permissible unbalance of load on the windings. As in the case of a bus tie reactor, a balanced load on two paralleled buses will produce no load on the reactor, but an unbalanced load will produce load, and consequently losses, in the reactor. The transformer with twin windings replaces the bus tie reactor, and additional losses (a function of the reactance between windings) must be taken care of when the loads are unbalanced. The Roseland transformers are designed for a 40 to 60 per cent unbalance in load on the twin windings.

There are various methods of obtaining the desired reactance between twin windings. (Fig. 3.)

The method of coupling the twin windings by means of two parallel circuits in another winding is satisfactory where the ratio of the reactances (L_1 to L_2) and (H to L_1L_2 paralleled) is four to one, although provision must be made for losses due to circulating currents in the paralleled winding when the loads are unbalanced. Such a connection gives virtually the same constants for the system as two separate transformers of one-half capacity, although the windings are on the same core. If a ratio of reactances higher than four to one is required, part of the windings (H) may be paralleled as in Fig. 3d to give less coupling between L_1 and L_2.

Interleaving for reactance control

A most satisfactory method for obtaining the correct reactance between twin windings is by interleaving the coil groups with each other and with the other windings, as shown in Fig. 5. This method permits separate windings to be used and does not depend on circulating currents in a third winding to transfer power between the twin windings. The Roseland transformers are built with interleaved windings; the two low-voltage circuits being separate throughout each entire circuit within the transformer.

The transformer coils are well braced against mechanical stresses produced during short circuit. A large part of the windings is surrounded by the flat surfaces of steel laminations. The parts of the coils that extend beyond the core are held in place by means of structural steel pressure plates and tie rods. Each coil is in a vertical plane. Coils in the various windings are connected in groups, which are interleaved to give the best reactance requirements and the principal short-circuit stresses are in a horizontal direction; vertical forces which may occur due to slight displacement of coil groups during assembly are braced by means of heavy T-beams above and below the core where it passes through the coils, and the flat

surfaces of the coils and assembled coil groups make an ideal condition for mechanical bracing where it is required.

When the reactance between twin windings is more than four times the "through" reactance (i.e., the reactance between the main windings with the twin windings in parallel), there is a negative impedance branch in the three-circuit diagram. This means that when a short circuit occurs on one bus there is a tendency for the voltage to rise on the other bus. With the primary voltage maintained and little or no load on the transformer, the voltage rise on the non-short-circuited bus may be from 20 to 30 per cent. However, this is usually a theoretical condition only (as shown in the curve, Fig. 5), as the system will have sufficient impedance between the transformers and the source or sources of power to prevent any actual rise in voltage on the non-short-circuited bus.

The Roseland transformers, now rated as totally self-cooled units, are designed for 50 per cent greater capacities when equipped with the well-known hood type blowers. This equipment, consisting of a circulating fan and inclosing hood mounted on each radiator, may be installed at any time without taking the transformers out of service.

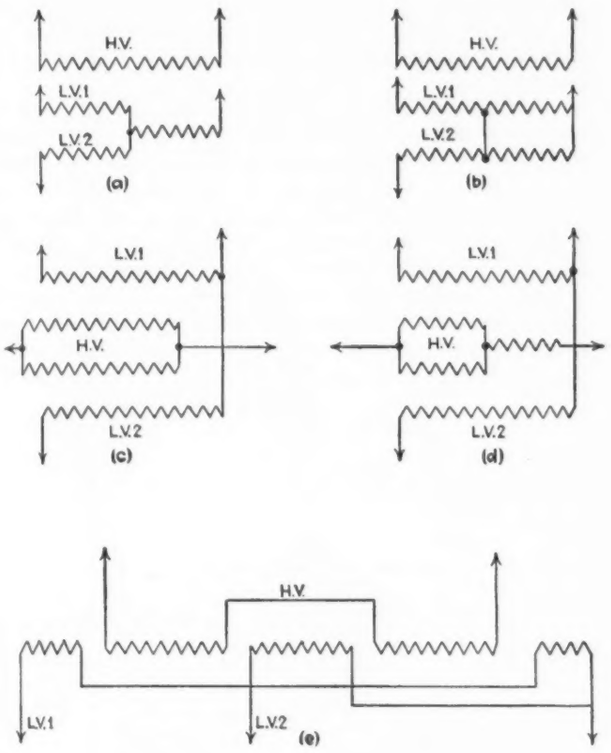


Fig. 3—Methods of obtaining desired winding reactance

(a) Part of twin windings have a common section.
(b) Part of twin windings paralleled.
(c) Coupling twin windings by means of two parallel circuits in another winding, 4/1 ratio of reactances.
(d) Ditto for higher than 4/1 reactance ratio.
(e) Interleaving coil groups, used in Roseland transformers.

Shipment of the Roseland transformers presented an unusual problem on account of clearances and weight. A special shipping tank was built for each unit, to permit loading the transformer proper without disassembling the core and coils. These shipping tanks were filled with dry nitrogen to insure the arrival of the transformers at their destination in a dry condition. The weight of each unit loaded in the special tank was 270,000 lb., the maximum capacity of the special drop-frame cars that were required for handling these heavy loads. An unusually low bridge clearance on the branch railroad near the destination necessitated a temporary lowering of the tracks 18 in. at this point, to pass the transformers. There was a total of 56 carloads, including sixteen 8,000-gal. oil cars, in the shipment of the first four transformers.

The physical dimensions and weights represented by these transformers are close to the maximum that it is economical to build at the present time. Larger kva. capacities with nominal or standard 220-kv. insulation and with two or three windings can be kept within these physical dimensions, so that shipment can be made without dismantling the core, coils and insulation. But it is probable that the economical maximum is passed when the size requires assembly of core and coils in the field.

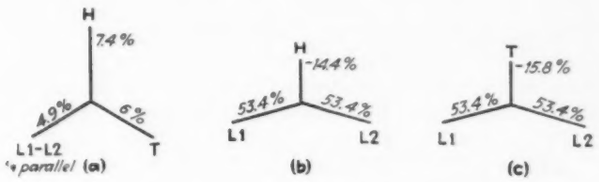


Fig. 4—Reactance values for various pairs

(a) Secondaries (in parallel) to high side.
(b) Secondaries (independent) to high side.
(c) Secondaries (independent) to tertiary.

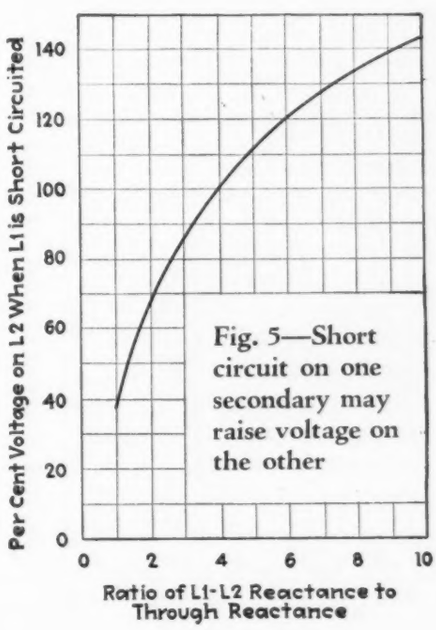


Fig. 5—Short circuit on one secondary may raise voltage on the other

Private, Bell and Leased Lines Serve West Penn*

By WILLIAM R. HAMILTON
System Operator West Penn Power Company

To maintain communication between different parts of its system the West Penn Power Company uses 1,500 miles of private open-wire line in addition to leased lines. There are 40 Bell telephone trunk lines entering the Pittsburgh general office. Each of the 30 district offices has one to four trunk line services and there are one or more to each attended substation and power house. The private lines are strung below virtually every 25,000-volt transmission line and most 132,000-volt tower lines.

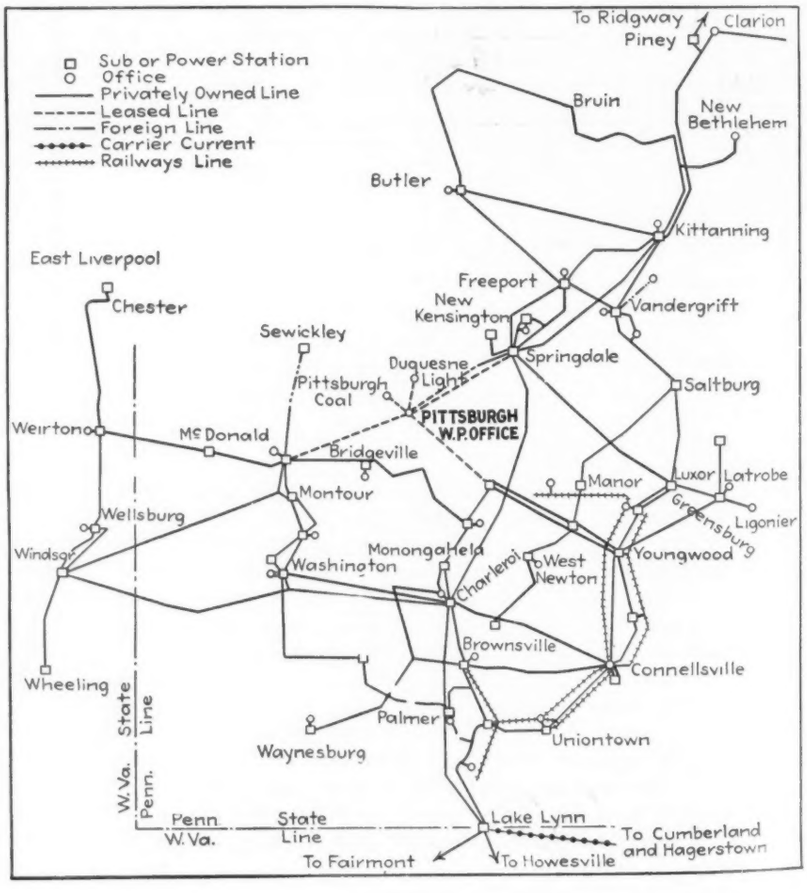
Although the private lines were built primarily to operate the system, 80 per cent of the calls over it during office hours are for commercial purposes. At the Pittsburgh headquarters the private system and leased Bell switchboard are interconnected. Each call on the private lines carries a switching charge of 3½ cents. The monthly telephone bills for leased lines and local and toll calls on the Bell system at the Pittsburgh general office building average about $2,000, of which $400 is for rentals. Outside the 1,100 intercommunicating calls passing through the Bell board at Pittsburgh per day there are 1,725 local and toll calls per day.

In general, the private lines along power lines are noisier and subject to more trouble and disconnection than leased lines or those built on separate right-of-way. Checks made since interconnection with the Bell system show that these lines talk up as well as if not better than the cable lines, which are more quiet, unless repeaters and other auxiliary equipment are installed on the cable lines.

Radio communication has been discarded because of severe restrictions imposed on its use by the Federal Radio Commission. Until recently the West Penn Power Company never built any carrier current stations.

The limits of the present private system have about been reached and definite plans for handling future communication traffic have been formulated. Restrictions have been placed on the use of private lines to give the greatest number of persons opportunity to use these lines and to permit the greatest possible business to be transacted over them and otherwise improve general traffic efficiency. The lines are always available for operating needs by giving the operating organizations the authority to commandeer them when necessary.

**Based on material appearing in a recent issue of "West Penn Life."*



Communication lines of the West Penn Power System

READERS' FORUM

Manufacturers Co-operated on River Crossing Cable

To the Editor of the ELECTRICAL WORLD:

In the January 24 issue of the ELECTRICAL WORLD on page 200 you describe a very interesting method of terminating the 66-kv. cables installed by the United Gas Improvement Company and the American Gas & Electric Company between Deepwater, N. J., and Wilmington, Del.

In reading the article I find an error. The statement is made in this article that the eight sections of cable were furnished by the General Cable Corporation. This is incorrect. Four of the cables were furnished by the Okonite-Callender Cable Company, Inc., and four by the General Cable Corporation. The engineering department of the Okonite-Callender Cable Company had been working in co-operation with the engineers of various companies which have been interested in these problems for the last three or four years and the final installation is the result of a very careful study by all concerned.

ROBERT J. WISEMAN,
The Okonite-Callender Cable Co., Inc. **Chief Engineer.**

Failure to credit Okonite-Callender should not, as might be inferred on rereading the original article, be attributed to R. W. Wilbraham, whose A.I.E.E. paper was abstracted.—EDITOR.

Men of the Industry

F. L. Carlisle New Chairman of Edison Board

FLOYD L. CARLISLE, who was elected chairman of the board of directors of the New York Edison Company at the recent meeting, as announced on page 348 of this issue of ELECTRICAL WORLD, entered the public utility industry eleven years ago, when he organized a syndicate which bought the Northern New York Utilities, Inc. His advance in this field was rapid and in 1929 he became chairman of the board of directors of Niagara Hudson Power

Corporation, which acquired the public utility interests represented by Northeastern Power Corporation, Buffalo, Niagara & Eastern Power Corporation and Mohawk Hudson Power Corporation.

Born at Watertown, N. Y., on March 5, 1881, Mr. Carlisle received his preliminary education in public schools there and at Dayton, Ohio, and was graduated from Cornell University in 1903 with an A.B. degree. Taking up the study of law, he was admitted to the New York bar in 1905 and began the practice of law. In 1910 he organized the Northern New York Trust Company at Watertown, N. Y., and was its president until 1922. In 1916 he headed a group of business men who bought control of the St. Regis Paper Company, to which acquisition he later added the Hanna Paper Company, Champion Paper Company and Norwood & St. Lawrence Railroad. In 1921 Mr. Carlisle and certain associates organized the investment banking firm of F. L. Carlisle & Company, Inc., with offices at 15 Broad Street, New York.

Mr. Carlisle is chairman of the board, president and director of the Eastern States Power Corporation, chairman and director of Niagara Hudson Power Corporation, Northern New York Utilities, Inc., and a director of the Power Corporation of New York, Niagara Falls Power Company and Mohawk Hudson Power Corporation.

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J. EDWARD MULLIGAN, general superintendent of the Weymouth (Mass.) Light & Power Company, has been elected chairman of the Electric Lines Club of New England.

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THEODORE KRONSHAGE of Milwaukee has been named by Governor La Follette of Wisconsin a member of the Wisconsin Railroad Commission to succeed Adolph Kanneberg, whose term has expired. Mr. Kronshage is chairman of the power committee of the League of Wisconsin Municipalities, which is vigorously sponsoring the program to put the state in the utility business. He is a prominent figure in Wisconsin, having served as a member of the board of university regents for six years and president for five years. Mr. Kronshage's term on the commission will be for a period of six years. The appointment was confirmed by the Senate February 11.

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DAVID LILIENTHAL has been appointed a member of the Wisconsin Railroad Commission by Governor La Follette of Wisconsin, to succeed Philip H. Porter, who recently resigned. Mr. Lilienthal is a prominent figure in the field of public utility regulation, both as a writer and as a lawyer. Since 1926 he has been the head of his own legal organization. He is secretary of the committee on public utility law of the American Bar Association and for the past five years has been a lecturer at Northwestern University on public utility law. He is author of a series of volumes on public utility economics and law which are in the process of publication. His volume on Wisconsin utility regulation was issued about two years ago. The appointment was confirmed by the Senate February 11. Mr. Lilienthal is not and never has been a resident of Wisconsin, so that his appointment is a departure from precedent.

R. B. Grove Named Vice-President in Edison System

ROBERT B. GROVE, secretary of the United Electric Light & Power Company, one of the five companies composing the New York Edison System, was elected a vice-president of the company at a recent meeting of the directors. At a meeting of stockholders he was made a director of the company. MELVILLE T. CHANDLER, assistant secretary, was made secretary, succeeding Mr. Grove.

In addition to his duties as secretary,

Mr. Grove has been assistant to the vice-president and general manager for ten years. In June he will complete 25 years with the company, having started as a draftsman. In 1919 he was made assistant to the electrical engineer and the following year assistant to Frank W. Smith, vice-president and general manager. He also served as assistant secretary from 1925 to 1928, when he was made secretary.

Mr. Grove has been active in committee work of the National Electric Light Association and was a vice-president of the New York Electrical Society. In company affairs he has been chairman of the general safety committee and secretary of the rate, budget, operating, construction and public relations committees.

The new secretary, Mr. Chandler, since 1925 has been connected with the executive offices of the company as assistant.

C. L. Karr Removes to Carolina

C. L. KARR, formerly superintendent of power of the Kansas Gas & Electric Company, Wichita, has been appointed operating manager of the Carolina Power & Light Company with headquarters at Releigh, N. C. He will be in charge of all operating departments of the company, which serves a consider-

able portion of both North and South Carolina.

Mr. Karr obtained his early experience in gas engineering as an employee of the Indiana Steel Company and later of the Ford Motor Company. He then spent ten years with the Detroit Edison Company as chief assistant engineer. In 1923 he joined the Kansas Gas & Electric Company, where as superintendent of power he had charge of all production and transmission, as well as engaging in special work in the public relations division.

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W. J. BLAKE WILSON of Vancouver has been elected a director of the Canadian General Electric Company, Ltd.

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GEORGE H. JENKINS, formerly manager of the Agawam Electric Company and the Ludlow Electric Light Company, and previously district manager at Shelburne Falls for the Greenfield Electric Light & Power Company, has been appointed manager of the Western Counties Electric Company at Amherst, Mass., to succeed J. J. O'Connell, who assumed new duties in Pittsfield.

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W. C. CAMPBELL, for several years in charge of retail operations of the Tennessee Electric Power Company, outside of Nashville and Chattanooga, has been appointed commercial manager of the company, a recently created executive position. Mr. Campbell has been associated with the company and its predecessors since 1919. He will have supervision over power sales, lighting sales, rural electrification and industrial development departments, together with the merchandising of electrical appliances.

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OBITUARY

Sir Charles Parsons

SIR CHARLES PARSONS, internationally known engineer and inventor of the modern turbine, died February 11, in his seventy-seventh year, while on a cruise to the West Indies. The application of steam turbines to general use did not become possible until 1884, when Sir Charles disclosed his master invention, which revolutionized marine travel. From his early youth Sir Charles exhibited a talent for science and was encouraged in this inclination by his father, the Earl of Rosse, who was president of the Royal Society and the designer of many improvements in the telescope that bears his name.

On completing his education at St. John's College, Cambridge, Sir Charles entered the works at Birr Castle, Ireland, where his father's giant telescope was constructed, but he soon left to serve an apprenticeship in the Armstrong plant at Elswick, Newcastle, remaining six years. Following a year on the experimental staff of Messrs.

Kitson of Leeds, he formed a partnership with Clarke, Chapman & Company of Gateshead, which was dissolved in 1889. In the meantime his inventions and scientific attainments had made him a prominent figure in the engineering world and he established his own works at Heaton, Newcastle-on-Tyne, for the manufacture of steam turbines, dynamos and other electrical apparatus. In addition to being chairman of the Newcastle company, he was also chairman of the Parsons Marine Steam Turbine Company, the Ross & Company optical works and the Parsons Optical Glass Company. He was made a Fellow of the Royal Society in 1898, and four years later received the society's medal. He was president of the Institute of Marine Engineers in 1905-06 and of the British Association in 1919-20. The Copley medal was awarded to him in 1928.

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JOSEPH BUEHLER, one of the pioneer electrical contractors in New York City, died February 7 at Santiago, Cal., where he had been living since last spring because of ill health. Mr. Buehler, who had retired from active business life, was 73 years of age. After receiving his preliminary training with the Edison organization in New York, he founded Buehler & Bateman, one of the early electrical contracting firms in New York, which became Hatzel & Buehler.

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AUGUSTINE J. MCDONALD, founder and first president of the Oswegatchie Light & Power Company, Gouverneur, N. Y., died at his home in that city January 19 in his eighty-first year. It was in 1888 that Mr. McDonald organized the Oswegatchie Light & Power Company, of which he continued as president until it was purchased by the International Paper Company in 1897. For years he was chairman of the committee on the improvement of the Oswegatchie River watershed and he took a prominent part in many other enterprises making for civic betterment.

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Dr. ING KOLOMAN V. KANDO died suddenly in Budapest January 13. Born in 1867, Dr. Kando, after his education at the Technical School of Budapest, spent many years with the Compagnie de Fives-Lille in France, where he did much useful work in connection with the construction of electric locomotives and machinery. Returning to Hungary in 1894, he became associated with Ganz & Company of that city and there he developed his system of high-voltage electric traction. Later he spent some years establishing for the American company the Westinghouse works at Vado in Italy. As a result of the war he returned to his native country, where he became in 1919 general director of Ganz & Company's works.

Financial and Statistical News

NEW financing has been virtually at a standstill during the past ten days. This has not had any beneficial effect on the bond market, which has remained sluggish since the upward movement spent itself early in the year. Utility bond levels have not changed appreciably during the week.

——UTILITY COMMON STOCKS WERE LEADERS in the upward movement of the past week, although they did not share the erratic gyrations of some of the industrials. The utilities showed remarkable resistance to selling pressure.

——APPOINTMENT OF FLOYD L. CARLISLE as chairman of the board of New York Edison is interpreted in financial circles as portending much closer relations, both financial and physical, between the New York City and up-state systems.

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Kansas City Utility Effects Economy

DURING THE MONTH of January the Kansas City Power & Light Company made an offering of first mortgage 4½ per cent gold bonds, due 1961, a piece of financing involving a total of $27,000,000. The purpose of the issue was to raise funds to retire 5 per cent, series A, bonds. The resultant saving which has been accomplished by means of this new financing, is made up of a great number of items, and when they are balanced one against the other, an approximate yearly saving of $75,000 has been effected. This figure, taken over the period of the remaining life of the series A bonds, which are being refunded, gives a total saving of approximately $1,500,000.

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Utilities Gain on Atlantic Seaboard

AN INCREASE OF 0.1 per cent compared with the corresponding month in 1929, making the total revenue $192,400,000, is indicated by a preliminary analysis of returns from central-station companies for December. This constitutes a rise of 3 per cent from November, which is slightly less than the normal seasonal increase but exceeds that in 1929.

Definite improvement over last year's record, to the extent of 2.5 per cent, occurred in the Middle Atlantic States; in the South Atlantic section the reporting companies did equally well, and in the West North Central region the gain was 1 per cent. Most other geographical divisions held at approximately the preceding year's figures, except the great manufacturing area of the Upper Mississippi Valley, which again reports a decrease, this time of 2 per cent, and therefore makes a relatively better showing than in other recent months.

NEW CAPITAL ISSUES

First and refunding mortgage 4½ per cent gold bonds, series C, of the Louisville Gas & Electric Company have recently been offered to the amount of $6,000,000, the price being 97 and interest, yielding over 4.68 per cent.

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The Central Illinois Electric & Gas Company made an offering of first and refunding mortgage gold bonds, totaling $15,000,000, at 94½ and interest, yielding over 5.45 per cent. These bonds, dated February 1, 1931, and maturing February 1, 1951, will be secured by a direct first mortgage on a substantial portion of the company's fixed properties. Net earnings were equal to more than 2.8 times the annual interest requirements on the entire funded debt of the company to be outstanding upon completion of this financing.

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Maine Company May Not Capitalize Bond Discount

A DECISION has been handed down by the Supreme Court of Maine supporting the Maine Public Utilities Commission in disallowing the petition of the Central Maine Power Company to issue stock to retire notes given to cover the discount on bond issues.

In February, 1928, the company filed with the Public Utilities Commission a petition to issue 7,913 shares of common stock "for the purpose of the discharge and lawful refunding of its obligation, to wit: its obligations incurred in providing the necessary funds for the acquisition of property used for the purpose of carrying out its corporate powers, for the construction, completion, extension and improvement of its facilities, and the improvement and maintenance of its service, to the amount of $791,386, which is the amount of unamortized discount on the several bond issues of Central Maine Power Company."

The company from time to time sold bond issues below par for the purpose of acquiring property and carrying on its business. The sale of such bonds at a discount necessitated the raising of funds by other means to provide the difference between the cost of the property or a proportionate part thereof and the proceeds realized from the sale of bonds. This difference was secured by the company by borrowing from various banks in the form of loans maturing not more than twelve months from the respective dates. The company has been obliged to renew such loans from time to time. The notes securing such loans are the obligations of the company, which it proposes to discharge and refund by the proceeds of common stock. The Public Service Commission at the time denied the petition. Exception was taken to this denial and the Supreme Court has now handed down its decision supporting the Public Utilities Commission.

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Public Utilities and Paper Lead Oregon Hydro

THE USE OF water power developed in Oregon is, according to figures compiled by the State Engineer, as follows: Municipal, eight plants, 17,410 hp.; public utility, 39 plants, 278,486 hp.; pulp and paper mills, five plants, 46,306 hp.; irrigation pumping, four plants,

2,886 hp.; miscellaneous, 24 plants, 8,989 hp.

With the total water power in use in Oregon as of December 31, 1930, placed at 354,077 hp., the Engineering Department reports an increase for 1930 over the previous year of 55,150 hp. Additions comprised a new 10,000-hp. plant on the McKenzie River by the city of Eugene, an improved runner in first unit increasing power from 35,000 to 40,000 hp. and a second 40,000 hp. wheel in the Oak Grove plant of the Portland General Electric Company and a 150-hp. plant on Jackson Creek.

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Recent Listings

The Boston Stock Exchange has approved the listing of 200,000 shares of $5.50 dividend series cumulative preferred stock of the New England Gas & Electric Association.

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The Boston Stock Exchange has removed the common stock of the Cumberland County Power & Light Company from the list.

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New York Stock Exchange has authorized the listing of 160,000 additional shares $4 cumulative preferred stock (no par) of the Standard Gas & Electric Company, upon official notice of issuance upon conversion of 6 per cent convertible gold notes, dated January 1, 1931, due October 1, 1935.

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Vermont's 90,000 Families Have 40,000 Radios

OF THE 4,374 FAMILIES in Rutland, Vt., 2,297, or 51.2 per cent, reported having radio sets. This information, based on the 1930 count, is contained in a report of the Bureau of the Census for Vermont. The state average was 44.6 per cent; the county figures range from 51.2 per cent for Bennington County to 37.7 per cent for Grand Isle, which happens to be the smallest, with fewer than 1,000 families, and consists mainly of a group of islands in Lake Champlain.

No other county reported less than 40 per cent, nor did any one of the three cities of 10,000 population or larger. The following table is condensed from the census report, which gives figures also for each of the fourteen counties:

	Number of Families		Persons per Family		Families Having Radio Sets, 1930	
	1930	1920	1930	1920	Number	Per Cent of Total
The state	89,439	85,804	4.0	4.1	39,913	44.6
Cities						
Barre	2,857	2,418	4.0	4.1	1,354	47.4
Burlington	6,028	5,241	4.1	4.3	2,598	43.1
Rutland	4,374	3,630	4.0	4.1	2,297	52.5

Bankers Find Rights Policy Less Popular at Present

THE popularity of issuing rights to buy common stock as a means of financing seems to have lost ground sharply during the past year. But within the last two or three months it has had a considerable revival among the utilities.

January was a particularly active month in this respect. Among the large utilities which offered rights to stockholders in January are Pacific Gas & Electric Company, Public Service Corporation of New Jersey and Southern California Edison. Late in December similar announcements were made by Commonwealth Edison Company and Public Service Company of Northern Illinois. The total offerings included in this group exceeded $80,000,000.

The policy of offering rights reached a peak in 1929, when companies of every type listed on the New York Stock Exchange offered rights involving subscriptions exceeding $2,000,000,000. The total dropped last year to less than $1,000,000,000. In the power and light field alone the total dropped from $234,000,000 in 1929 to $156,000,000 in 1930.

Generally speaking, the policy of offering rights to stockholders is more popular and more favorably accepted in a rising market. The market for the rights usually discounts a rising market on the stock involved well in advance and profits on such issues are frequently large. It is not improbable that the policy may increase substantially during coming months as the business and market situation improves.

From the standpoint of the bankers, there seems to be a current feeling that other methods of financing are preferable. In most cases, of course, rights issues are underwritten by banking houses, and the banking group should be in a position to gage the temper of the market.

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Canadian Company Makes New Offering

FIRST MORTGAGE SINKING FUND gold bonds, series A, of the West Kootenay Power & Light Company, Ltd., have been issued to the amount of $6,500,000, the price being $97.50 and accrued interest, to yield 5.18 per cent. These securities, dated March 1, 1931, mature March 1, 1956. The company owns and operates three hydro-electric plants on the Kootenay River, British Columbia, and is building a fourth, on completion of which its total installed capacity will be 219,000 hp.

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Spokane Utility Sells Preferred Stock

THE WASHINGTON Water Power Company has offered for sale to residents of Washington, Idaho and Oregon, 10,000 shares of its $6 cumulative preferred stock priced at $100 per share and accrued dividend, according to the announcement of Frank T. Post, president.

Funds received from the sale of the stock will be used for capital expenditures in the territory which the company serves. Under the plan of sale, investment dealers in the company's territory are undertaking the sale of some 3,500 shares. The remainder will be sold by the company through its employees on a commission basis. The plan calls for a sales period of 90 days. The last customer-ownership stock sale by the Washington Water Power Company occurred in May, 1929, when 32,000 shares of the same stock, priced at $102 per share, and accrued dividend, were sold in eleven days.

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NEWS BRIEFS

The Brooklyn Edison Company has announced the giving of rights to common-stock holders for the acquisition of one additional share, at $100, for each nine shares held of record of February 21. As there are 900,000 shares outstanding, proceeds of this financing will be $10,000,000, and will be used for new construction in 1931. The issuance of the stock has been authorized by the New York Public Service Commission.

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Pacific Gas & Electric Company reports over-the-counter sales of its 5½ per cent first preferred stock in January amounting to $1,664,000. Sales averaged $1,125 per purchaser and were almost wholly confined to investors living in the territory served by the company.

More than $2,600,000 par value of Great Western Company 6 per cent and 7 per cent preferred stock was exchanged for Pacific Gas & Electric Company's first preferred stock in the first week after the offer was made to Great Western stockholders. The offer expires February 28. The company anticipates that practically all outstanding stock will be exchanged and that the remainder will be liquidated at par. This was the procedure followed subsequent to the acquisition of the Byllesby properties in 1927.

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A circular will shortly be mailed to holders of the class "A" 7 per cent preferred stock of the Feather River Power Company, offering them the right to exchange one share of this stock ($100 par value) for four shares of Pacific Gas 5½ per cent preferred stock ($25 par value). The Feather River stock is entitled to $100 per share in liquidation and proceedings to this end will be brought upon expiration of the exchange offer.

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Norway's Large Consumption Chiefly Industrial

NORWAY'S TOTAL POWER PLANT rating as of January 1, 1929, including industrial plants, amounted to 1,686,256 kw.; the energy output in 1928 is estimated at 8,500,000,000 kw.-hr., which is equivalent to 3,000 kw.-hr. per inhabitant. This information has been received by the ELECTRICAL WORLD from the Norwegian Water Course and Electricity Service. Statistics for 1929 and 1930 have not yet been published.

For the supply of electricity for public utility purposes the figures, again as of January 1, 1929, are as follows:

Total power plant rating, kw.	475,000
Water power, kw.	455,000
Fuel power, kw.	20,000
Capacity available for public utility purposes, including leased, kw.	520,000
Transformer rating, kva.	720,000
Invested capital, millions of kroner*	936
Amount hitherto written off, millions of kr.*	169.5
Remaining book value of investment, millions of kr.*	766.5
Power plant investment per kw., kr.*	770
Transmission and distribution investment per transformer kva., kr.*	560

*One krone = $0.27 approximately.

These statistics supplement those for earlier years published in the ELECTRICAL WORLD of November 8, 1930, on page 885.

Norway's extraordinarily large consumption per capita is due in considerable measure to the nature of her industries, to railway electrification encouraged by abundance of water power, and to the great development of industrial electric plants. These have an aggregate rating 2.5 times that of the public utility plants, and evidently operate at a high capacity factor.

Dividend Announcements

Directors of American Power & Light Company have declared a quarterly dividend of $1 per share on the company's $5 preferred stock, series A, for payment April 1, 1931, to stockholders of record March 14, 1931. This is an increase in the quarterly rate from 87½ cents per share paid January 2, 1931.

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Directors of the Philadelphia Company have declared an initial semi-annual dividend of 25 cents a share on the $10 par value 5 per cent non-cumulative preferred stock, payable March 2 to holders of record February 10. This stock was recently issued in exchange for the old 5 per cent non-cumulative preferred stock of $50 par value on the basis of five new shares for each old share held.

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New Bedford Gas & Edison Light Company has reduced the quarterly dividend 25 cents a share, from a $4 annual basis to a $3 annual basis.

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The board of directors of the Central States Electric Corporation has decided to pay stock dividends on its common stock semi-annually in lieu of quarterly, as in the past. In inaugurating this policy a semi-annual dividend of 5 per cent in common stock was declared on the common stock, payable July 1, 1931, to holders of record June 5.

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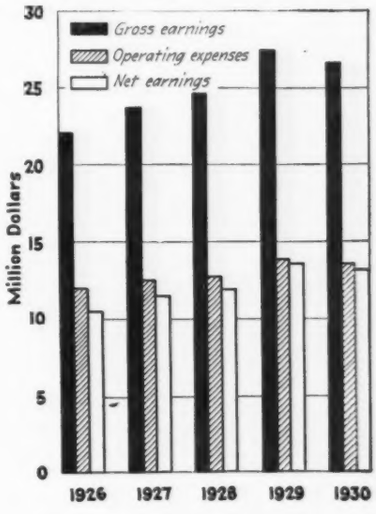
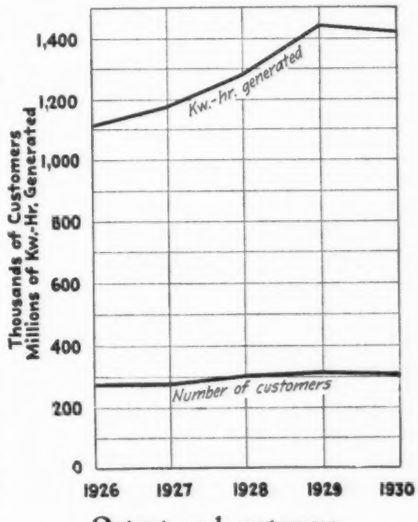
Cleveland Electric Earnings Down Marginally

DESPITE business conditions, the Cleveland Electric Illuminating Company was able to maintain its earnings for the year 1930 only slightly below the record totals for 1929. The decline in gross revenue was 3.1 per cent and in net 2.5 per cent. Operating costs were reduced 3.6 per cent and the operating ratio was reduced fractionally to 50.5 per cent.

The total number of consumers as of December 31, 1930, was 307,080, a decrease during the year of 2,550, or 0.82 per cent. The total number of residential consumers at the end of the year was 270,474, a decrease from the close of the previous year of 1,808. One hundred and twenty-nine new industrial and commercial consumers, having a total load of more than 50,000 kw., were connected with the company's system during 1930.



Cleveland Electric earnings since 1926



Output and customers recede slightly

The company's maximum load for the year 1930 was 323,367 kw., a decrease of 7.7 per cent from the maximum load for the year 1929. This peak load was reached on January 8, 1930. Kilowatt-hours generated totaled 1,418,142,328, a decrease from the production of the previous year of 5.1 per cent.

Expenditures for betterments and extensions throughout the entire system amounted to $17,679,250. The retirements were $1,672,903, leaving net additions amounting to $16,006,346.

Business News and Markets

Telegraph Code for Electrical Industry

A STEP in the direction of increased business efficiency in a major industry is announced in the development of a telegraph code book, to be known as "Lcode," for the entire electrical field. The new code book is being prepared under the sponsorship of the National Electrical Manufacturers' Association.

A joint industry committee, representative of the Association of Electragists, National Electric Light Association, National Electric Wholesalers' Association, Radio Manufacturers' Association, Radio Wholesalers' Association and the Society for Electrical Development, has co-operated with N.E.M.A. to issue a code book of standard five-letter combinations "to include all words and phrases commonly used in the purchase and sale of electrical equipment and supplies."

A subcommittee consisting of A. B. Zerby, Westinghouse Electric & Manufacturing Company, chairman; J. F. Quinlan, General Electric Company, and W. O. Conway of the N.E.M.A. staff has the work in hand. A contract has been made with the Business Code Company of New York for the publication and it is expected that it will be available to the industry by April 1. It will contain nearly 50,000 code words allotted to general business phrases and technical terms, with a tabular section covering calendar, letters, telegrams and numerals.

This is the first instance of an entire industry sponsoring a single standardized code and it is calculated to effect not only large economies in money and time but a workable uniformity in terminology throughout every division of the business and art. The life of the first edition is put at five years and the various associations are making individual efforts to have the terms as inclusive as possible in anticipation of developments in the industry during that period. It is believed that many thousands of dollars will be saved each year by the use of "Lcode" and that the public will be served with greater speed and efficiency by the extended use of telegraph communication. The code is not designed to supersede private codes now used for intracompany communication, although it is anticipated that in many instances it may have this effect.

None of the sponsoring or co-operating organizations is profiting in the sale of "Lcode." The joint committee elected to pass on the profits to purchasers in the lowest possible price and thus enlarge the distribution as well. A maximum list price of $6 has been set, which may be reduced to $5.50 if sufficient pre-publication orders materialize. Orders are being sent direct to the Business Code Company, Inc., 2 Rector Street, New York.

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Hessel & Hoppen Join Westinghouse Group

PURCHASE BY THE Westinghouse Electric Supply Company of the Hessel & Hoppen Company, electrical jobbers, of New Haven, to take effect March 1, has been announced. William R. Hoppen, treasurer and one of the three incorporators of the firm, will retire. Frank L. Ferguson, now president of the firm, will become manager.

With the acquisition, the firm becomes one of about 60 large jobbing houses under the control of the Westinghouse Electric Supply Company, a subsidiary of the Westinghouse Electric & Manufacturing Company. It was incorporated in the fall of 1911, when it occupied one of three stories in the building at 36 Crown Street. Dealing exclusively in wiring devices, the firm expanded until it occupied the entire building, which it finally purchased. Its success in later years is attributed to its entry as a jobbing agent in the field of public utilities.

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General Electric Unit Started in Cleveland

CONSTRUCTION OF A $1,000,000 plant, the first unit of an extensive development in Cleveland by the General Electric Company, has been started by the Austin Company, engineer and builder of Cleveland. The Austin contract includes all construction and installation of plumbing and will be completed August 1.

A definite upturn in business and the fact that building costs are the lowest in years were factors leading to the decision of General Electric officials to start expansion projects at this time. Daily output of incandescent lamps has been increasing since October, although the company is still some 200,000 lamps behind in orders. When completed, the new plant will employ 1,000 workers.

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Building More Active

JANUARY SHOWS SOME promising indications of renewed activity for the building industry and consequently for many allied industries, according to F. W. Dodge reports of contracts awarded during the month.

Although a drop of about $17,000,000 in the New York metropolitan area is found in total contracts awarded in January, 1931, as against January, 1930, residential building, which is expected to lead the way to returned prosperity, shows an increase of 18 per cent.

In the 37 states east of the Rockies the total contracts awarded for new buildings during the past month amounted to $227,956,400, as compared with $323,975,200 for the first month of last year. Public works and utilities lead in this total with $95,211,100. This class is followed by non-residential with $78,370,800 and by residential with $54,375,500.

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Electrical Advertising Conference This Month

AS ALREADY ANNOUNCED, an electrical advertising conference under National Electric Light Association sponsorship will be held at the Westinghouse Lighting Institute, in New York, February 25 to 27. E. A. Mills, New York Edison Company, has been appointed general chairman and W. T. Blackwell, Public Service Electric & Gas Company of New Jersey, vice-chairman.

Subjects definitely scheduled for discussion include: Why Everybody Profits from Electrical Advertising; a Historical Outline of Outdoor Advertising; Electrical Advertising Practice—Construction and Installation; Design; Color and Its Uses in Outdoor Advertising; Architectural Provisions for the Use of Electrical Advertising; New Developments in Electrical Advertising; the Use of Photo-Electric Cells in the

Control of Electrical Advertising; Legislative and Electrical Code Considerations; Power-Factor Corrections in Electrical Advertising; Maintenance; Blazing New Electrical Advertising Trails; Central-Station Electrical Advertising Field Experiences; Where Electrical Advertising Fits Into the Advertising Picture, and Electrical Advertising in Dealer Identification. Speakers of national prominence and experience in the particular fields covered by their subject will make addresses.

The conference is expected to attract prospective electrical advertising users as well as present users, utility and sign executives; advertising, architectural and civic interests and others who profit in one way or another from the correct use of this forceful modern merchandising aid.

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General Electric Holds Refrigeration Convention

THE FOURTH ANNUAL national sales convention of the General Electric Company's electric refrigeration department will be held in Cleveland February 26 and 27, when 800 distributors and keymen from every state in the union will gather. The convention will sound the keynote for the 1931 sales drives.

The business program will include such speakers as T. K. Quinn, New York, vice-president General Electric Company; Chris Steemstrup, General Electric engineer, Schenectady, N. Y.; Dr. George A. Allison, director electric refrigeration bureau, National Electric Light Association, New York; W. H. Crawford, vice-president General Contract Purchase Corporation; Floyd Gibbons, internationally known author, war correspondent and radio celebrity, and others.

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Label Service on Electric Motors

LABEL SERVICE on electric motors for use in hazardous locations as defined in article 32 of the National Electrical Code has recently been established by Underwriters' Laboratories.

In common with all other devices and materials listed under the reexamination service, it has been necessary to identify such listed motors by a comparison of the style or model numbers of the motors with the lists and cards published by Underwriters' Laboratories.

The labels include the wording "Underwriters' Laboratories inspected motor for use in hazardous locations," together with the class (1 or 11) location for which the motor has been found suitable as a result of test. As a means of providing further information to inspection authorities and users of these motors, these devices are classified in several groups and arranged according to the degree of hazard of the location in which the motor may be used.

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TRADE BRIEFS

Ward Leonard Electric Company announces the appointment of the Beedle Equipment Company as sales representative in the Cincinnati and Dayton districts.

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Illinois Testing Laboratories, Inc., has appointed Porter Hurd as its representative in eastern Pennsylvania, southern New Jersey, Delaware and Maryland.

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Youngstown Sheet & Tube Company shows net profits for 1930 of $7,036,132, equivalent to $5.17 a share on common stock. This compares with $17.28 in 1929 and $9.53 in 1928.

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Reliance Manufacturing Company of Illinois and subsidiaries report for year ended December 31, 1930, net income of $107,093, after charges and depreciation. This compares with net income in 1929 of $643,435.

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E. C. Lackland, formerly with Rockbestos Products Corporation, Inc., has become manager of the asbestos wire division of the Collyer Insulated Wire Company, Inc., Pawtucket, R. I. The company manufactures heaters, and now contemplates producing asbestos, insulated wire and cables, including range, fixture, switchboard, motion picture, and various other types of heavier cables and all other items involving asbestos insulation.

Copper Demand Is More Active

FOREIGN DEMAND for copper continued active, absorbing about 13,000 long tons in the past week. Domestic buying was not as active as a week ago, but sufficient in volume for large producers to take a fair share of the business. The market, aided by more encouraging news regarding the actual movement of fabricated copper, developed quite a firm undertone.

	Feb. 11, 1931 Cents per Pound	Feb. 18, 1931 Cents per Pound
Copper, electrolytic	10	10⅛
Lead, Am. S. & R. price	4⅛	4⅛
Antimony	7	7.10
Nickel, ingot	35	35
Zinc, spots	4.35	4.35
Tin, straits	26⅛	26⅜
Aluminum, 99 per cent	23.30	23.30

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Westinghouse Cuts Working Hours

BEGINNING MARCH 1 all the works and offices of the Westinghouse Electric & Manufacturing Company will omit Saturday operations, except as involved in maintaining adequate service with customers and others with whom the company does business, according to an announcement by President F. A. Merrick.

Mr. Merrick's announcement states that the plan to be followed for the immediate future is to shorten the working week to the extent represented by the work normally required on Saturday throughout the company. As this reduction of service represents approximately 10 per cent, that amount of reduction will apply to all salaried employees. Similar arrangements have already been put into effect as to employees on an hourly basis.

Mr. Merrick emphasizes the point that this arrangement is solely an emergency measure to spread the work through this period of severe business depression and that normal arrangements will be reinstated with the advent of normal times.

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DELINQUENT ELECTRICAL ACCOUNTS

(National Electrical Credit Association)

Number of Accounts Reported

Division	January 1930	January 1931	Per Cent Inc. or Dec.	Twelve Months 1929–30	Twelve Months 1930–31	Per Cent Inc. or Dec.
New York	308	248	—19.5	3,128	3,258	+ 4.2
Middle & Southern Atlantic	236	129	—45.3	2,047	1,689	—17.5
New England	107	82	—23.3	1,505	1,351	—10.2
Central	835	630	—24.6	8,106	8,054	— 0.6
Total	1,486	1,089	—26.7	14,786	14,352	— 2.9

Total Amounts Reported

	January 1930	January 1931	Per Cent Inc. or Dec.	Twelve Months 1929–30	Twelve Months 1930–31	Per Cent Inc. or Dec.
New York	$73,342	$33,480	—54.3	$690,576	$472,448	—31.6
Middle & Southern Atlantic	34,232	14,541	—57.5	280,013	270,900	— 3.3
New England	22,008	5,241	—76.1	222,251	156,994	—28.4
Central	110,846	58,988	—46.8	1,003,079	975,557	— 2.7
Total	$240,428	$112,250	—53.3	$2,195,919	$1,875,899	—14.6

Market Conditions

ROUTINE buying continues the rule in the Eastern district and commitments are rather more severely limited than was earlier anticipated. Government and marine business promises to reach substantial proportions in the near future. Railroad and industrial buying is featuring Pacific Coast business. Volume of sales, however, is still limited.

——INDUSTRIAL EQUIPMENT ORDERS, principally for small apparatus, feature New England business. Middle West and Southwest orders are still restricted more or less to immediate requirements, although inquiries have improved.

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PACIFIC COAST

—POWER COMPANIES *and railroad purchases feature the present market, while larger industrials also show improvement. Prices are steadier and sales are better distributed, though even former quantity buyers are purchasing in as small quantities as possible.*

—RAILROAD ORDERS INCLUDE *half a carload of dry batteries, signal and wiring supplies. Freight receipts for January are said to be subnormal.*

Power company purchasing is large and well distributed and includes such orders and inquiries as a year's requirements of treated poles, sizes 15 to 90 ft., for the city of Los Angeles, eight assorted carloads of poles, sizes 40 to 60 ft., for Glendale, 20,000 ft. outside No. 10 conductor paper and lead street-lighting cable for San Jose. Half a carload of telephone wire, valued at $4,000, for Los Angeles, five 37,000-volt circuit breakers for Los Angeles and such machinery orders as a $30,000 Westinghouse turbo-generator set for steamship service, $30,000 worth of auxiliary motors and controls for a shipbuilding company, a $25,000 automatic control system for Los Angeles and 22 50-kva. Westinghouse speed regulators for the same.

Other industrial orders include an $8,000 General Electric switchgear equipment for the Ford plant at Richmond, a $4,000 switchboard for government service near Honolulu, a $2,000 gas engine generator set for Portland and a feeder switchboard equipment valued at $14,000 for Los Angeles. Many bonds for building construction for unemployment relief work are being voted upon, including San Francisco's $2,500,000, already carried; Fresno's $2,000,000 for a municipal auditorium and $2,000,000 for Los Angeles. The outstanding order is reported by a San Francisco office and covers $750,000 worth of aluminum wire and cable for a 736-mile installation between Diablo and Skagit in Washington.

Specifications are being written and bids will be called within 60 to 90 days by Seattle Municipal Lighting Department for in excess of $360,000 worth of apparatus for a city light tower substation. Apparatus includes $150,000 in switches and supporting structures, $70,000 in transformers, $70,000 in current-limiting apparatus, $40,000 in bus regulators, $10,000 for a hydraulic elevator, $10,000 for control devices, $5,000 for switchboard equipment and approximately $6,000 for miscellaneous equipment. A contract has been awarded to Westinghouse by the Seattle Lighting Department for two truck-type 433-volt safety inclosed switchboards and one spare truck for Lake Union steam auxiliary and North substation on a bid of $55,689 and bids will be opened February 20 for about $5,000 worth of sleeve-joint, single-fiber duct.

Seattle jobbers have been notified that an order for $50,000 worth of motors for the $3,200,000 Ford Motor Company assembly plant under construction in Seattle will be placed in Detroit, also that panel and switchboards for same installation, costing about $20,000, may be placed in the East.

CONSTRUCTION PROJECTS

Glendale, Calif., has authorized fund of $121,000 for extensions and improvements in lighting department, including overhead and underground lines, substation equipment, etc. Atchison, Topeka & Santa Fe Railway Company, Los Angeles, has filed plans for addition to car shop at Richmond, Calif., to cost $80,000. Pacific Gas & Electric Company, San Francisco, Calif., has approved plans for equipment storage and distributing plant at Santa Rosa, Calif., reported to cost $75,000. Beaver Wood Products Company, Portland, Ore., has plans for plant to cost about $70,000. Ford Motor Company, Detroit, Mich., has filed plans for assembling plant, including power plant, at Seattle, Wash., to cost $3,000,000. Southern Colorado Power Company, Pueblo, Colo., has approved plans for transmission line from Pueblo to Orchard Grove. Denver, Colo., contemplates ornamental lighting system.

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SOUTHWEST

—THE PAST WEEK *has shown no marked change in business conditions. The volume of stock sizes of apparatus sold has apparently increased slightly.*

One encouraging feature is that a large proportion of shipments has been to industrial concerns. Utilities have not begun buying heavily from 1931 budgets. Contracts reported are for an electric enameling furnace, 345 kw. demand, costing $31,000, which is a repeat order, and a lot of miscellaneous turbo-generator parts amounting to $12,000.

CONSTRUCTION PROJECTS

Public Service Company, Tulsa, Okla., plans power substation and line extensions to cost close to $100,000. Oklahoma Gas & Electric Company, Oklahoma City, Okla., plans power substation and line extensions at Davis, Okla., to cost $75,000. Falls City Refining Company, Falls City, Tex., plans gasoline refining plant at Henderson, Tex., to cost about $75,000. Houston Salt Company, Houston, Tex., plans plant near Hockley, Tex., to cost $150,000.

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SOUTHEAST

—ACTIVITIES IN THE *electrical field of the Southeast continue very quiet, with the volume of orders and inquiries only fair. There is a satisfactory amount of business pending, but present indications are that letting of orders will be postponed several months.*

—A GOOD DEAL *of interest is evidenced regarding "trackless trolleys" and some satisfactory business in this line may develop in the next few months.*

A power contract was signed in Georgia last week which will involve the purchase of 300-kva.-11-kv. substation materials. One company ordered in the past week $7,750 worth of insulators and $3,950 worth of creosoted pine poles. Some other central-station orders were for $2,130 worth of distribution transformers and $1,600 worth of insulators.

CONSTRUCTION PROJECTS

Virginia Electric & Power Company, Richmond, Va., plans extensions in 13,000-volt transmission line in city, to cost $35,000. United States Engineer Office,

Memphis, Tenn., will receive bids on February 24 for one 15-kw. steam engine-driven generating set (Circular 345); also, on February 25 for a similar unit (Circular 339). Johnson City, Tenn., is arranging bond issue of $1,000,000 for a municipal electric light and power plant. Construction Quartermaster, United States Army, Fort Benning, Ga., will receive bids until March 4 for three transformers and accessories (Circular 17).

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EASTERN

—CONDITIONS IN THE *electrical equipment market in the Eastern district show little change. Power companies give no inclination of breaking the monotony of routine buying for immediate needs and current commitments are being rather severely limited to that end. Industrials trend to light demand, with outlook indefinite.*

—GOVERNMENT DEMAND *is coming forward in a promising way and orders from that quarter will mature in the early weeks ahead. Marine account gives evidence of better strength through impending awards for some sizable vessels, including a government cruiser. Lighting equipment is in better demand and some worth-while business is in sight.*

A leading manufacturer of prime movers and other electrical equipment says that since the first of the year there has been no marked indication of advancing account and one week is simply duplicating the other. A maker of outdoor lighting fixtures, poles, etc., in northern New York reports improved business, with resumption of capacity schedule at the plant, following a number of weeks of curtailed operations. A copper producer has secured an order for 2,000,000 lb. of material, said to be the first sizable commitment that has been received in the last six months.

The Navy Department has placed an order with Westinghouse Electric & Manufacturing Company for main propelling machinery, auxiliaries and spare parts for service at the Brooklyn navy yard, totaling $572,500. The New York Shipbuilding Company has tendered a low figure in competition with two other bidders for the construction of a 10,000-ton cruiser for the government at $10,450,000 and is expected to secure the award; an important allotment of electrical machinery will be required for the vessel.

Business for electrical equipment in the Philadelphia district is quiet. Central-station demand is at low ebb, but, with prevailing improved sentiment, this market is expected to show substantial betterment within 30 to 60 days. The South Philadelphia Works of the Westinghouse company reports two sizable orders for geared turbines of 1,200 and 550 hp., respectively, with condensers and auxiliary equipment for dredging installations at New York and Chicago, including primary pumping machinery. At Erie, Pa., the General Electric Company is increasing the production schedule at its local works and contracts for electric railway equipment now on hand insure full-time operations for several months to come. A total of fourteen bidders have submitted proposals to the government for electric airway beacons on the Florence-Richmond section of the Richmond-Jacksonville airway and the award will soon be placed.

CONSTRUCTION PROJECTS

Signal Supply Officer, Signal Section, Army Base, Brooklyn, N. Y., will receive bids until March 10 for 160,700 ft. of cable and 21 reels (Circular 85). General Electric Company, Schenectady, N. Y., has filed plans for a wire filament plant addition to incandescent lamp works at Cleveland, Ohio, to cost $1,000,000. Board of Education, New York, contemplates five vocational and continuation schools, each to cost over $1,000,000, in connection with school construction program to cost $65,000,000. Department of Public Works, Philadelphia, Pa., will receive bids until February 26 for switchgear and auxiliary equipment for Belmont water station. Department of Supplies and Purchases, Philadelphia, Pa., will receive bids until February 25 for electrical supplies (Class 171). Department of Commerce, Washington, D. C., will receive bids until February 26 for engine-generator plants. Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until March 3 for insulated cable for Mare Island navy yard (Schedule 5127) and until March 10 for 13,700 dry batteries for different navy yards and for 105,500 flashlight batteries (Schedule 5077).

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NEW ENGLAND

—INDUSTRIAL EQUIPMENT ORDERS *mainly for small motors and control apparatus gained in volume during the past week. One order for small motors recorded by a prominent manufacturer amounted to about $25,000. Several small lot orders of interest were also reported. Negotiations continue to show interest on the part of machine tool manufacturers and appliance firms.*

Central-station supplies, including two 15,000-kva. transformers, oil switches and circuit breakers amounting to about $250,000, were recently ordered for a new substation in western Massachusetts. Plans for three other substations in this district are being considered. Industrial electric heating is attracting attention and orders recently placed for this type of equipment amount to over $40,000, according to one manufacturer. Heat-treating furnaces are in favor. General scheduled materials maintain an even trend. Heavy electrical power machinery orders are pending for new turbo-generator installations and a generator unit for a western Massachusetts water power company.

CONSTRUCTION PROJECTS

Bureau of Yards and Docks, Navy Department, Washington, D. C., will receive bids until March 11 for motor-generator sets and switchboard for the Boston, Mass., navy yard, estimated to cost $60,000 (Schedule 6428). Green Brothers Company, Springfield, Mass., will establish yeast manufacturing plant at Trenton, N. J., to cost about $100,000. Connecticut Light & Power Company, Hartford, Conn., plans power plant at Bristol, Conn., reported to cost close to $100,000.

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MIDDLE WEST

—NOT MUCH CHANGE *in general business is noticeable this week in the Middle West section. The volume of business is holding up fairly well.*

—INDUSTRIAL ACTIVITY *is somewhat better, with a consequent gain in employment. The major activities are in a slightly improved position, particularly in the automotive industry.*

Various railroads are specifying a considerable amount of equipment, while maintenance purchasing is somewhat larger. The various utility companies are proceeding conservatively with as much new construction work as planned for this quarter, while an appreciable amount of cable and apparatus is on inquiry at this time. Some of the interesting items placed this week include thirteen single-pole, 1,500-volt, 3,000-amp. air circuit breakers, two 57-cell operating bus batteries, 280 demand meters 5 to 150 amp. capacity, several construction orders aggregating $75,000 and "Mazda" lamps to cost $125,000.

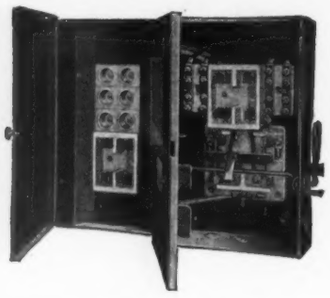
CONSTRUCTION PROJECTS

United States Lake Survey Office, Detroit, Mich., will receive bids until March 3 for two 10-kw. electric generating units (Circular 4). Consumers Power Company, Jackson, Mich., has authorized fund of $6,500,000, for extensions and improvements in power plants, transmission lines and power substations. Rich Manufacturing Company, Los Angeles, Calif., plans valve manufacturing plant at Battle Creek, Mich., to cost $200,000. Bureau of Yards and Docks, Navy Department, Washington, D. C., is asking bids (no closing date stated) for installing turbo-alternator at Great Lakes, Ill., estimated to cost $19,000 (Specification 6420). Standard Oil Company of Ohio, Cleveland, Ohio, plans asphalt refining plant at Toledo, Ohio, to cost about $750,000. Ohio Edison Company, Akron, Ohio, contemplates power house to cost $200,000, and power substation extensions. Northwestern Light & Power Company, Cedar Rapids, Iowa, has authorized addition to power plant at Grundy Center, Iowa, to cost $60,000.

New Equipment Available

Combination Lighting and Range Unit

A NEW COMBINATION lighting and electric range unit, using the standard 60-amp., three-wire, 125/250-volt meter test type switch directly connected to a surface type panel, constructed with three three-wire lighting circuits and



one 60-amp., three-wire heating circuit, has been announced by the American Electric Switch Corporation, Minerva, Ohio. This branch circuit attachment may be connected as six two-wire lighting circuits and one three-wire heating circuit.

This unit comes fully connected, including six wire flexible meter loops for watt-hour meter and all connections between the service switch and load side panel. It is necessary for the contractor only to connect his line into the unit and his circuits out. Ample provision is made in the top of the unit so that the circuits and range cable can leave through the top.

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Portable Testing Set for Current Transformers

A PORTABLE TESTING SET for making exhaustive periodic tests of instrument transformers at their place of installation is announced by Herman H. Sticht & Company, New York. It is designed to fill the need for such tests especially in the case of transformers that cannot be moved owing to their weight.

The testing set is accommodated in a portable case and all components are arranged systematically to facilitate inspection and use. The indicators are placed on the right and left respectively and an ammeter is placed between them for testing as to whether the terminals of the transformers have been connected in the proper order. The sensitivity regulator is fixed over the ammeter. Directly next to the ammeter are the two keys for putting the instruments in circuit; these should be depressed only after the set has been connected up in the proper way.

On releasing the keys the instruments are automatically disconnected from the circuit, which prevents damage to the movements if the wrong connections have been made. The multi-step switch for regulating the burden is placed in the top left-hand corner. It is used for connecting up a load of 0, 15, 60 volt-amperes, either ohmic or inductive. Two terminals, "Supplementary burden," are provided for connecting up further testing or operating burdens. When not required these terminals should be shorted.

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Explosion-Resisting Motor and Switch Combined

A COMBINATION of explosion-resisting motor and switch for use in hazardous vapors was recently placed on the market by the Master Electric Company, Dayton, Ohio. Its widest application is on gasoline-dispensing pumps. The switch is built into the motor frame as an integral part of the motor. It provides compact and simplified construction, reducing the assembly cost for the pump manufacturer.

Some of the other features are bringing the motor leads out through the motor frame, which permits the removal of both end covers without disturbing the seal; moisture-proof construction, quiet operation, high starting

torque, large overload capacity and exceptionally sturdy bearing construction.

These units are designed for either horizontal or vertical shaft operation and, as stated, are suitable for use wherever the surrounding atmosphere may be inflammable due to the presence of hazardous vapors. These motors can be purchased in sizes from 1.8 to 1.3 hp. inclusive, repulsion-induction, polyphase and direct current, all of which are interchangeable as to external dimension.

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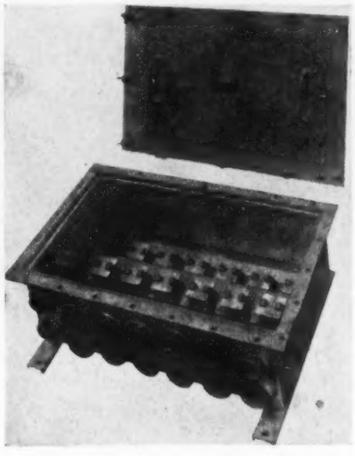
Low-Voltage Cable Boxes with "PB" Terminators

A LINE OF LOW-VOLTAGE underground cable boxes equipped with type "PB" terminators has been announced by the Delta-Star Electric Company of Chicago. These cable boxes are provided



with mechanical entrances designed for use with lead-covered cables. This new model provides for paralleling of six 1,000,000-circ.mil cables and in addition has one 300,000-circ.mil tap. It is also equipped with disconnecting links and fuses.

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1,000-Volt, 200-Megohm Insulation Tester

A LIGHT-WEIGHT, COMPACT and relatively inexpensive instrument for testing insulation resistance up to 200 megohms at 1,000 volts has been announced by James G. Biddle Company. It is especially intended for use by power companies, street railways, steam and electric railroads and industrial plants for testing practically all types of 440- and 600-volt equipment at a potential that is definitely higher than the working voltage. Also it is suitable for testing motors, generators and cables of higher voltage ratings where readings of insulation resistance do not normally run over 200 megohms. On 220, 110 and lower-voltage apparatus it conveniently provides a combined insulation resistance and high potential test.